THE AMERICAN

# GAS LIGHT JOURNAL

INC.

PUBLISHED WEEKLY, AT 42 PINE ST.

VOLUME CII. No. 19.
Whole No. 2,083.

NEW YORK, MONDAY, MAY 10, 1915.

Subscription, $3 Per Year.
$4 Canada, $5 Foreign.

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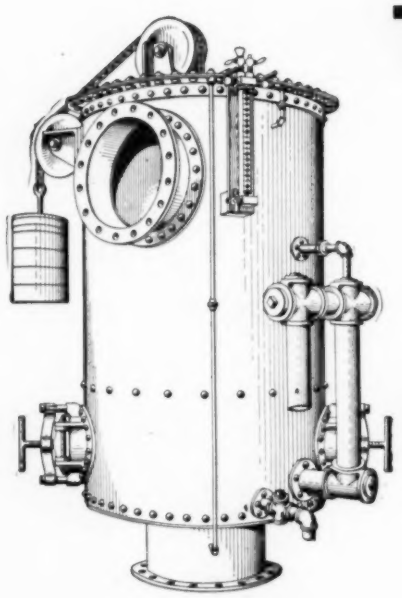

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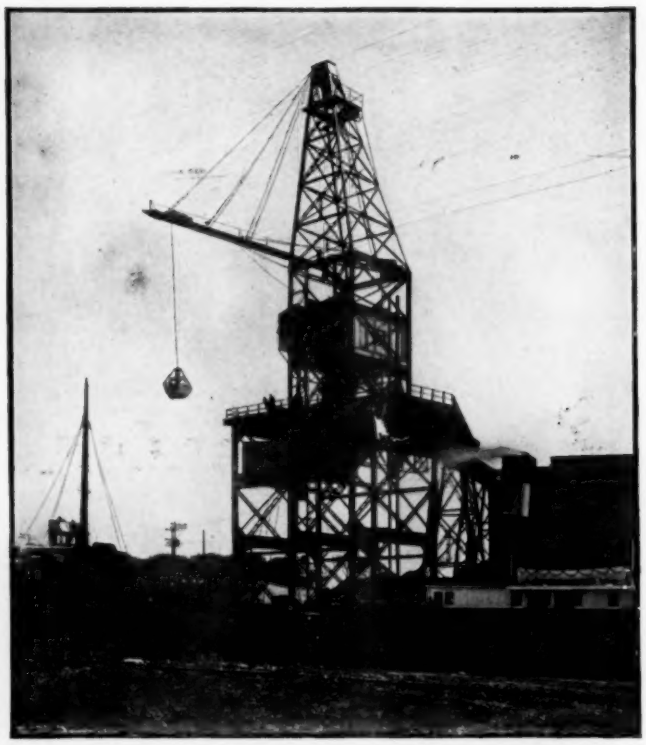

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VOL. CII., No. 19. NEW YORK, MAY 10, 1915. WHOLE No. 2,083

# EXPERIENCE WITH A BY-PRODUCT COKE OVEN PLANT.

[From a Paper by C. C. BOARDMAN read before the Illinois Gas Association.]

When a coke oven plant is considered as a gas producer, it is a case of the tail wagging the dog, because it is primarily a coke maker, and the coke problem is ever present and has to be solved every day. The coking heat is obtained by gas, and the salable gas in the holder is only the surplus above that needed to operate the plant, and in dollars and cents is worth about the same as the other two by-products, tar and ammonia.

Briefly the operating cycle in a by-product plant is as follows:

At least a month's supply of coal is kept in storage, the storing and recovering being done with a traveling bridge and bucket. A part of the coal used each day is taken from the storage pile, and is replaced each day out of coal received; in this way the storage pile gradually changes. The coal is usually received into hoppers, that dump it on belts or conveyors to the breaker, which breaks the large pieces and eliminates the slate. From the breaker, the coal passes through a hammer mill or crusher where it is ground to the fineness of washed sand. If the coal is a mixture of two different kinds, usually a high and a low volatile coal, the belt from the crusher is arranged to fill either of two mixing bins. These bins pass the coal into a third bin simultaneously, the proportion being regulated at will. This third bin is the storage for the day's supply, and is placed above the ovens, usually at one end of the battery, in such a way that the charging larry can pass directly under the bin and be filled by pulling slides. The larry has four hoppers, a full load being the charge for one oven. The filled larry is brought out over the oven to be charged, the oven lids are removed, and the car then dumps its load of coal into the oven, where it is leveled off with a leveling ram, usually a part of the pusher. The charge remains in the ovens from 16 to 30 hours. The ends of the ovens are removable doors, which, being rather heavy, are removed and set by a door machine.

The discharging side of a battery is called the coke side; the other is the pusher side. A coke pusher is a ram, operated by rack and pinion, mounted on a suitable structure that is moved along the front of the battery to the oven to be pushed. The operation is then as follows: The doors are removed from the ends of the oven, the pusher ram brought up to the face of the coke, and a coke quenching car brought up on the opposite side. As the pusher ram enters the oven, the quenching car is put in motion; as the ram passes on into the oven, the hot coke drops into the quenching car, spreading the coke evenly along the bottom of the car. The quenching car, on being filled, is drawn to the quenching station, where water is sprayed over the coke, either from a single noozle or a series of nozzles. In some plants, the coke is entirely quenched at

Fig. 1.—Bird's-eye View of the Plant taken from the Gas Holder. The temporary High Pressure Condenser is shown in the foreground.

this point; in others the quenching is completed on a long sloping wharf. Quenching cars are arranged to dump at the side onto a wharf or into receiving pockets that feed the coke belts. The larger the piece of coke the more valuable the product, and the less handling the coke receives the larger the size can be maintained.

The following screening systems are in use: Flat screens over which the coke slides, the fine coke dropping through; grizzlies, which are a series of cast iron wheels which lift the large pieces forward, allowing the small pieces to fall through, doing away with a good deal of tumbling and breakage; and rotary screens which take coke in at one end, drop the small coke through, and the large coke at the opposite end, the breeze being taken out first and the next larger sizes as the coke approaches the end of the screen, the different sizes falling into their allotted bins. Two systems of loading into cars, are chutes for open cars, and box car loaders for closed cars. The latter is an elevator at the end of an adjustable arm that is pushed into the car, and receive its coke from a chute. The travel of the elevator throws the coke into either end of the car.

The gas evolved from the coal rises to the top of the oven chamber, and is drawn off at one side into a collecting main corresponding to the hydraulic main in a retort house, the difference being that it is not sealed with water, but is constantly flushed with a stream of tar to avoid the formation of lampblack and pitch along the sides and bottom. If the gas is separated into lean and rich gas the collecting main is double, and connected to the oven with a butterfly valve. In this way the gas evolved during the first few hours of the charge may be drawn off in one main, and the remainder in the other main. A constant pressure is maintained on the collecting main and ovens, by means of a governor at the outlet of the collecting main. These governors either operate direct from the gas pressure, or by means of vacuum control, or electrically. The electric governor seems to give the best satisfaction. It consists of a butterfly valve operated from a quadrant and pinion drawn by a small electric motor. The motor runs in either direction, governed by an electric switch connected to a gasometer. If the pressure in the gasometer drops, the motor acts to close the valve, and vice versa. The gas is drawn from the ovens through coolers that take out most of the tar and naphthalene and some of the ammonia. Where direct recovery process is used, all of the ammonia that drops out ahead of the ammonia apparatus is put through an ordinary still, but instead of an ammonia condenser receiving the vapors, they are drawn back into the gas. The coolers are just ahead of the exhausters, and following the latter are the tar extractors, which take out the last traces of tar. The direct recovery process requires gas heated above the point at which the tar is taken out, and the next apparatus is a reheater, its function the reverse of the coolers. The sulphate process is simple. The gas is bubbled through a solution of sulphuric acid forming sulphate of ammonia. As the gas leaves the saturator, it passes through a baffle tank to take out all traces of acid carried along, and is then ready for the purifiers and the meter. The sulphate is ejected from the saturators by an air lift. More or less liquid comes up with the salt, and the mixture is deposited in an iron tank where the liquid is allowed to drain off. The salt is drawn from these tanks intermittently into centrifugal dryers, and is then sent on to the storage pile.

In plants where the gas is separated into rich and lean, the by-product apparatus is in duplicate, that is, the lean gas flows through one set of apparatus and the rich through a duplicate set, up to the outlet of the saturators. The lean gas is taken back to the ovens to maintain the heat and the rich gas goes through purifiers for commercial use.

This paper deals rather intimately with the plant of the Coal Products Manufacturing Company at Joliet, and its distributing partner the Western United Gas and Electric Company, so I will give a brief description and history of that plant.

Its operation does not differ essentially from other plants, but there are details which have been changed from time to time. These will be taken up chronologically and with illustrations.

The Coal Products plant was built in 1911–1912 on a site across the Desplaines River from the Sanitary District power house north of the City of Joliet. This site is at the end of the deep water way, and one of the air castles of the future is coal arriving in barges at a large dock, transferred to the plant by gravity cars, the filled car drawing the empty car back by cable.

The plant planned was to be a battery of 35 ovens, capable of coking 600 tons of coal per day; coal handling equipment capable of taking care of 1,800 tons of coal per day maximum; coke handling equipment for a maximum of 960 tons per day; a by-peoduct plant to take the gas from 70 ovens; power plant; 2,000,000-foot holder; office, shop and store room to correspond. The site included leased land, and land through which some railroads had right of way options, so space for permanent buildings was somewhat limited. The yard level was much lower than the surrounding country, with Joliet lime stone at an average depth of 2 feet. The effect of this was avoidance of deep excavations, and when it was absolutely necessary to dig, permanent sumps and pumps had to be installed to take care of seepage water. For instance, pumps have to be run constantly to keep water out of the chimney flues and coal hoppers.

Fires were kindled in the ovens July 24, 1912, before the rest of the plant was finished. The time to heat up was estimated at 6 weeks and it was important that this limit be maintained, as the peak load of the gas company was expected in September, and their works were taxed to very near their capacity. Preparatory to heating up, the ovens had been lined with fire brick and the doors enclosed with temporary brick walls, holes being left for firing and removal of ash. Gas house coke was used. On September 11th, proper heats had been obtained and the ovens were ready to charge. The plan was to push the temporary brick lining, ash, fire, etc., out of the ovens into the quenching car with the coke pusher, but six weeks accumulation of ash, clinker and fire brick and coke, 19 inches wide, 10 feet high and 39 feet long, was a very different matter than the coke from a 13¼ ton charge of coal. It took 3 days and 3 nights of constant labor to clean out 33 of the ovens. The temporary fronts had to be taken out by hand, and in some cases, the entire charge was raked out, and this at a temperature of 2,000° F.

Charging coal into a coke oven for the first time is a rather delicate operation. The oven walls have been heated to a coking temperature by a foreign source of heat, which is suddenly withdrawn and the heat stored in the brick must be sufficent to coke the charge of coal, the gas evolved being enough to put back into the combustion chamber to maintain the heat for the next charge. If the stored up heat dissipates before the gas is removed, the temperature gradually drops and a year's labor is lost. In our case the delicacy was increased by trouble with the oven doors as well as debris in the ovens. The doors were designed self-sealing. Oven doors are cast iron frames lined with fire brick, a recess around the edge fitting against the face of the oven. In the self-sealing door, this recess is filled with a pliable material to serve as packing, and the oven face was designed with a loop of wrought iron pipe for this packing to press against, water circulating through the pipe to keep the temperature down. Braided hemp wrapped with a fine copper wire was used, and as soon as the door was put on the hemp started to burn, and before the charge was coked all that remained was a few strands of wire. The hemp packing was replaced with asbestos, which has proved very serviceable.

The first 4 or 5 months of operation developed many small but vexatious failures of apparatus. The unexpected always happened with untried apparatus and unskilled crew that have to be broken in and organized. Time and space will only permit a partial list of these and the remedies or improvements inaugurated.

### Gas Apparatus Troubles.

1. *Tar Extractors.*—When the plant was started the extractors failed to extract the tar. New sets of plates had to be installed in each of the three.

2. *Sulphate Dryers.*—The bearing supports were not equal to the eccentric loading, and had to be strengthened, and the speed of the machine reduced.

3. *Drains.*—Additional drains had to be installed on nearly all the apparatus in the by-product building, and the seal had to be increased.

4. *Meters.*—The meters were Venturi type, with exposed pipe ahead of each meter. These constantly stopped up with naphthalene, and no reliable readings were obtained until the meters were lagged and steam jacketed. An electric meter has been installed in place of the rich-gas Venturi meter, and quite accurate results obtained on it. A rotary meter is now being installed, and the Venturi meter is to be put back. It will then be possible to run them in combinations of two or three, the electric meter first. As the electric meter raises the temperature of the gas 2°. it will give ideal conditions for both the Rotary and the Venturi meter, and some very interesting data are expected.

### Battery Troubles.

1. *Reversing Machine.*—This type of oven requires reversal of the fuel gas every 30 minutes. The construction features are two chimney flues, one on each side of the battery, the two sides of a battery being identical. Below each oven is a separate regenerator,

and the oven walls are vertical combustion chambers joined at the top to a common horizontal flue. The operation is as follows: Air is drawn in through the regenerator on one side of the battery for 30 minutes. During this time, gas is admitted just above the regenerators and mixed with the air at practically a Bunsen burner in each vertical flue. Combustion takes place in the vertical flues on one side in an upward direction across a horizontal flue, and in a downward direction through the vertical flues on the opposite side, the hot gases heating the opposite regenerators, the gas then passing down into the chimney flue. The 30 minute reversal causes the air and gas to be admitted on the opposite side and the same cycle is carried on. This reversing is done by a clock arrangement, the gas cocks and air ports being connected to a cable operated by the machine. The original reversing machine tore itself out of the concrete setting, and had to be replaced with a machine of different design.

2. *Stand Pipes.*—The gas connection between each oven and the butterfly valves in the collecting main is made up of two pieces of pipe. The part on the oven is in the form of a seal pot; the part on the butterfly valve fits into this pot, the joint being flexible and the seal maintained with water, which also cools the pipe. The first stand pipes installed had an offset on one side with a spooning hole. Due to unequal exposures and weight, these pipes cracked at the offset, necessitating a change in design.

3. *Water Line.*—Cooling water was required on each side of the battery for the oven doors, and on the pusher side for the stand pipes. The first pipes installed were hung on brackets just above the ends of the ovens. They froze solid as soon as the weather grew cold, and new pipes were laid on top of the battery and inside of the stand pipes, where they are kept warm.

4. *Trolleys.*—All the moving machinery on the battery is operated by electric motors, including the larry car, door machine and pusher. The original electric distribution was through angle irons fastened on insulators. These insulators soon collected a coating of soot with the result of constant short-circuiting; and if an angle iron was bent slightly, the trolleys refused to follow them. They were replaced with copper wire, the trolleys for the pusher being taken off of the battery entirely.

5. *Coke Guide.*—The coke guide operates on the door machine rails and is moved with this machine. The guide is made up of steel strips that keep the coke from spreading between the face of the ovens and the top of the quenching car. It was found that this guide must be very accurately placed, or the oncoming coke would push it into the car. This was remedied by changing the design of the drop apron between the guide and the ovens, and by putting on double flanged wheels.

6. *Collecting Main.*—The collecting main was "D" shape, with a partition in the center not quite reaching the bottom. A seal was maintained with tar, pumped in at one end of the main, and taken out at the other end, the idea being to flush out deposits. As an assistance, a scraper on a cable was left in the bottom of the main, which could be drawn back and forth. It was necessary to change this scraper and strengthen the cable and operating drum to get it to work the full length of the main.

7. *Quenching Apparatus.*—The quenching car is drawn by a small locomotive. As originally designed it was dumped by hand, a lever at one end of the car tripping the doors. To work this lever, a man had to stand on one end of car on rather precarious footing, and some times the lever would catch him on the head. After two such experiences the car was equipped so that the dumping could be done by air from the locomotive. The first quenching valves installed operated with a valve wheel. This was found too slow and required too much effort to open and close it. A quick opening lever valve was installed.

### Coal Handling Troubles.

1. *Recovery Hoppers.*—On first receiving coal at the plant, it was found that the bucket on the traveling bridge could not clean more than about two-thirds of the coal out of an ordinary car. No provision had been made for getting this coal except by dumping the car in the belt hopper where it could later be recovered by the bucket. This afforded a storage pile at only one point along the bridge track. Concrete recovery hoppers were built at intervals of 100 feet, where hopper cars could be dumped and the coal recovered later with the bridge.

2. *Belt Hopper.*—This was built in solid rock to a depth of about 27 feet, and was almost an artesian well. At first syphons were installed to keep the water down. As a last resort a sump was dug at the side of the hopper about 30 feet down through the rock, in an attempt to strike the vein of water and draw it off at a lower level than the coal hopper. This sump was left open and an electrical float operated pump installed. It kept the water out of the hopper, although it is rather expensive.

### Coke Handling Troubles.

1. *Hoppers.*—As in the coal equipment, there were no means of getting the coke into the stock pile. A concrete wharf had to be built the entire length of the coke storage space where the quenching car might dump the coke and the bridge bucket later recover it.

2. *Screens.*—The speed of the screens had to be reduced considerably. As operated at first the coke was broken excessively, and the vibration caused innumerable shut downs. Wear and tear on the screens was found a considerable item of maintenance. Wear of the screen cannot be avoided, and requires having new screens to install as the old ones give out. The domestic screens installed were rotary, the screen being fastened to a frame work with spokes, the screen driven from a central shaft. The spokes wore on the outer ends, and with a little overload began to break off. The entire screening system in the domestic building had to be overhauled, and the design of the screens changed, and the screens made of punched plates instead of woven iron rods.

The above changes may be classed as of minor importance, as they did not involve large expenditures of money compared with the value of the plant, nor cause any serious shut down. Matters which might be classed as serious will now be described.

*Power Plant.*—The supply of steam, electricity and water had to be constantly maintained; practically all the coke and coal handling and battery machinery depended on the electric supply, and any trouble meant a complete shut down of that part of the plant. The whole plant depended on the steam supply, and the water supply seemed to be the foundation of all troubles. Troubles with the electric and steam supplies were remedied by economical use, and careful inspection of the apparatus. Steam economy was accomplished by cutting down the steam used for pumping, wasteful pumps and syphons were done away with, and electric pumps substituted. The largest saving was by installing a feed water heater in the by-product building, taking water from the gas coolers. The heater brings this water up to 200° using part of the exhaust steam, the balance is used in the gas reheaters and in the ammonia still where live steam was previously used. The water from this heater is conveyed to the boiler room, and through the boiler feed water heater, which takes steam from the pumps. It was possible to get enough hot water from the gas coolers to keep the holder tank from freezing during the winter.

Fig. 2.—Traveling Bridge and Coke Storage Pile.

The water supply of the plant was found entirely inadequate. The original installation consisted of two 2,000,000-gallon per day electric driven pumps at the river, a 10,000 gallon storage tank at the plant, and three distributing pumps in the power house. The pumps at the river were replaced by new pumps of double the capacity; an additional storage tank of 160,000 gallons was built and the circulating pumps replaced by pumps of double capacity, and an additional high pressure fire pump installed. The saving of steam in the by-products building saved water, that is, the cooling water was used twice. Water from the condenser on the engines and gas compressors was repumped to the quenching tank, making another saving.

*Coal and Coke Handling.*—The coal and coke storage originally planned was 150 feet wide between bridge rails by 1,000 feet long;

one end to be used for coke, the other for coal, and a small space for purifying material and boxes. In March, 1913, during a very strong wind storm, the bridge started to run away at the south end of the yard; the operator put on the emergency brakes, but the only effect was to slide the wheels. By the time the bridge reached the north end of the yard it was moving very fast, and when it reached the bumper it collapsed, carrying the end rails with it, and was a total loss. A new bridge was contracted for, having in addition to the hand operating brakes, an electric emergency brake, that automatically grips the rail when the operator leaves his cage. Additional safeguards were made by installing bridge anchorages for fastening the bridge when idle.

Fig. 3.—The Original Coke and Coal Handling Apparatus.

The plant's most serious accident occurred on October 3, 1913. The original coal handling equipment consisted of a breaker and crusher in one building, a belt from this building carrying the coal to the mixing and storage bin at the head of the battery. The building was 125 feet high and consisted of two mixing bins, below these the mixing belts, and in the lower section, the storage bin, holding a day's supply of coal, The building was of steel and concrete, the only wood being in stairs and floor of the gallery. On October 3d, just after the day gang had replaced the night gang, the larry car was backed under the coal bin to receive a charge for the first oven. When the slides of the bin were opened to fill the car, there was a flash of fire up into the bin, and within a very few minutes the entire interior was filled with fire, and the building collapsed. The explanation accepted is that there was some fire on the bottom of the larry car hoppers; the coal bin being nearly empty at this hour of the morning, instead of the coal immediately dropping when the bin was opened, coal dust sprinkled down in just the right proportion to form an explosive mixture. This ignited and the bin was filled with the mixture, the fire immediately spread to every part of it. Luckily as the bin fell it twisted sideways instead of covering the battery, although the wreckage of the gallery fell across about half of the ovens. The plant was completely shut down for five days. During that time the gas supply was maintained with water gas and what was in the storage holders of the Western United Gas and Electric Company. On the day gas was again made at the Coal Products plant, the supply in the storage holders was down to 400,000, the average daily quantity in storage usually being about 4,000,000. Getting the plant in operation within five days was an almost superhuman task. A temporary coal conveyor was thrown together to bring the coal from the crusher house direct to the larry cars. In order to work while the wreckage was being cleared away, the charging station was placed at the opposite end of the battery. It was necessary to run the coal belt constantly day and night as there was no storage for crushed coal. Temporary railroad tracks were laid so that locomotive cranes could be brought up to the coal bin wreckage. By the use of accetylene torches the wreckage was cut into sections and carried away. The wreck of the bin carried down the two section mains to the by-product building, and also part of the collecting main on the end of the battery. The collecting main was braced and a single pipe installed for the suction main. In order to keep up the gas supply, the plant was started again as soon as this first pipe was installed. Some of the ovens were charged and enough gas made to save the day. Due to the settling of the collecting main and the breaking of the tar flushing mains, pitch began to collect in the bottom of the main, and within a few days almost filled it. The tar scraper could not be operated and it was necessary to almost shut down again while this pitch was taken out with picks and spoons. The trouble continued more or less serious until the new coal bin was erected and we had time to straighten up the supports of the main and get it back in good order. The lesson learned from this explosion was to keep the storage bin and the mixing bins separate. The new design requires that the coal be lifted from the crusher by a bucket conveyor into the two mixing bins. These bins then feed the mixing belts, which in turn feed the rubber belt to the storage bin. The storage bin is a concrete box capable of holding 800 tons of crushed coal, supported on steel frame work. The motor for driving the coal belt is in the mixer building, the only machinery in the coal bin being the idlers in the belt gallery.

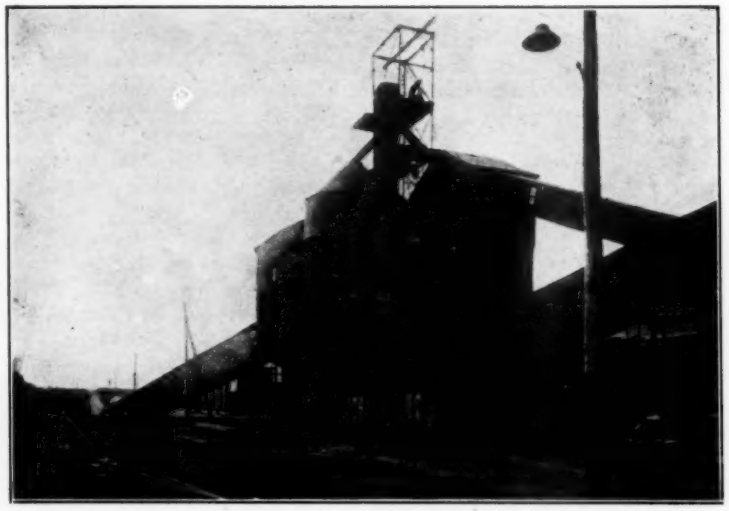

Fig. 4.—Showing the New Coal Mixing Building as an Addition to the Original Crusher Building.

*Battery.*—The original installation at the plant provided for a future battery of 35 ovens. The growth of the Western United Gas and Electric Company was so fast during the original construction that the gas made from the 35 ovens was not enough to supply the wants, and it was decided to split the future battery, installing first 18 ovens to take care of possibly 2 years' growth, and at the end of that time to install 18 more. These 18 new ovens were started in the spring of 1913, and the installation so made that no new machinery would need to be purchased. It required removing the quenching tower from the coal bin to a point north of the new installation. The new battery was slightly different in design from the original one, one of the main points being positive control of the air supply by fans. Instead of having one collecting main with a partition and tar scraper, there are two single mains, with slope enough for the flushing tar to wash the solid material along.

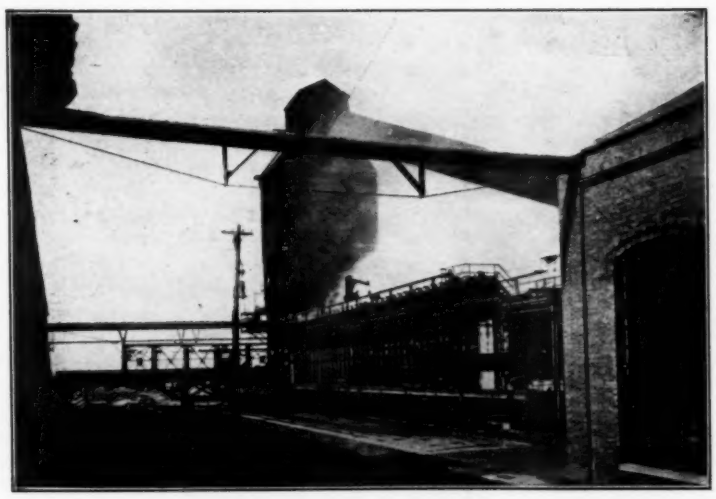

Fig. 5.—Showing the Original Battery and Coal Bin in Operation.

The new battery was heated up with oil instead of coke, using temporary brick lining and doors, the heating was very much easier and the brick pushed out like a charge of coke.

By the time the new battery was ready, a number of ovens in the new battery had to be rebuilt, owing to damage from the fire in the coal bin. Six of them were torn out and renewed, and the balance will be renewed this summer.

In order to renew one oven, it is necessary to shut down three, one oven on each side of the one to be changed. The brick walls are then cut out, the cutting beginning at the top. As soon as a channel is cut through, I-beams are put in to support the top of the battery until the new wall is built.

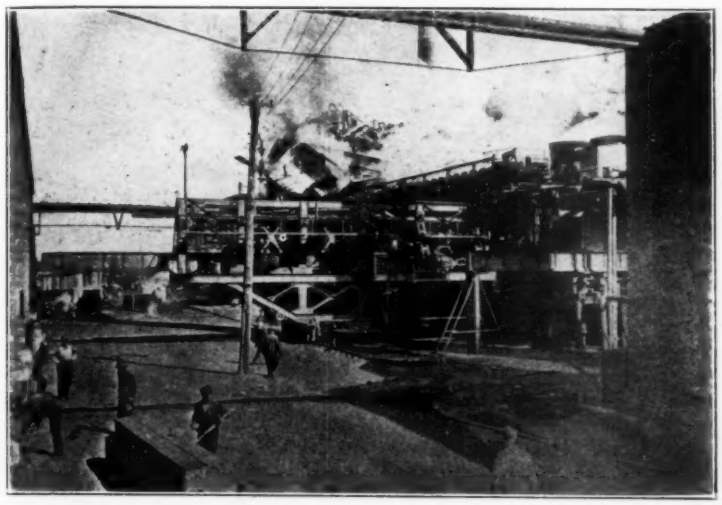

Fig. 6.—Taken from the same Point on October 3d, one hour after the Wreck of the Coal Bin.

The winter of 1913-1914 developed one other serious trouble, the danger from spontaneous combustion in stored coal. That winter was rather warm and wet. The coal storage place was filled with two parallel piles of coal, one high volatile coal and the other Pocahontas, in all about 20,000 tons. In January, 1914, heat was noticed where the two piles of coal touched, and the hot spot spread. The first remedy tried was to move the burning coal. This was started, but as soon as air was admitted to the centre of the pile, all the coal burst into flame. Three-inch pipes were driven into the coal pile and water forced into the very bottom. This acted only as a temporary check, and it was decided that the entire pile would have to be moved. A coal bridge is very unsatisfactory for moving material in a direction parallel with the rails. The bucket holds between one and two tons, but for each bucket the entire bridge structure must be moved along the rails, and to move 20,000 tons would be an endless task. The bridge was used to take out the daily supply of the plant. A temporary railroad track was run to the south end of the bridge rails and spurred off between them for the locomotive crane and bucket. The crane transferred the coal with the bucket, picking it up in front and laying it down behind. As a way was opened into the pile, the rails were moved up, and the crane passed the full length of the coal pile. Where coal is not actually in flame, a mere shaking up and exposing to the air will stop fire. Before all the coal could be moved, much of it had coked, and the bottom of the pile was a sort of volcanic mass of coke, breeze and pitch.

While this stock pile was being moved a new pile was made at the north end of the plant. As the cars were unloaded, the railroad track was raised over the pile so that eventually we had a pile of coal 12 or 15 feet high with a track on top of it. This coal could later be recovered by a locomotive crane.

To avoid any more fires, the storage space was cut into 100 foot sections by stone walls 2 or 3 feet thick and 7 feet high. The stone walls made the line of demarcation sharp, and the coal was not allowed to run over the walls so that two coals would come together. If a fire did break out, it was isolated, and in a very short time that pile of coal would be used up. This proved valuable this winter when a hot spot appeared in one pile, but caused absolutely no damage.

This description will suffice for the Coal Products plant. Its operation is unique, in that the gas from it has to supply a territory spread over four counties, the farthest point being 75 miles away. There are no other plants running to assist it, and the gas made must be equal to the demand every day.

A coke oven plant has a certain inertia, due to its size, which makes its operation entirely different from a retort plant or water gas plant. For instance, if the demand for gas increases suddenly, the make cannot be brought up at once. The fuel gas must be changed on the entire battery, and this requires time and very careful attention; and the increased demand is taken care of by shortening the coking time and making more charges per 24 hours, and it requires at least 2 days before an increase in the gas made is felt. If more gas is made than is used, the reverse of the above operation must be made, or ovens may be pushed but not charged. The fuel gas on these ovens would be cut down and just a coking heat maintained. In this way a number of ovens can be kept empty until the demand for gas increases. The objection to this method is that cracks in the empty ovens open, and it is necessary to carbon them up again, but this may be avoided somewhat by leaving a different oven empty each day.

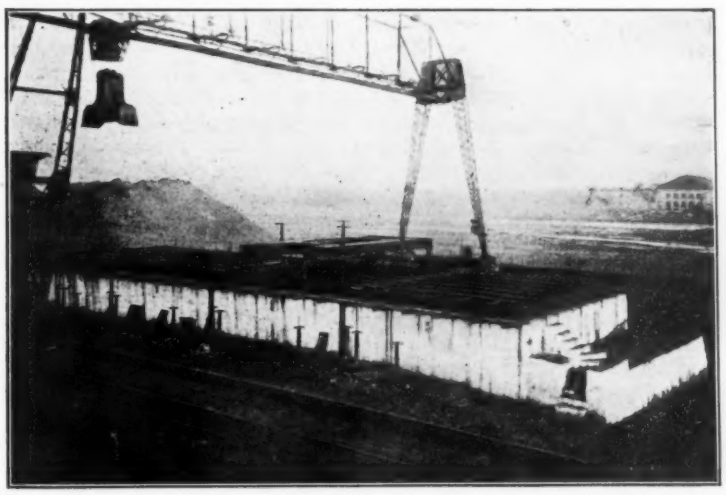

Fig. 7.—Concrete Purifying Boxes between the Bridge Rails.

Where a coke oven plant is making the entire output of gas, the storage capacity must be extremely large in comparison, and the auxiliary must be a water gas plant which can be started or stopped on an hour's notice.

This matter of storage capacity and machinery is a problem that must be solved for each individual case. For instance, if the distribution system is compact, the storage capacity and auxiliary apparatus should be at the plant. If the distribution system is spread over a large area and distribution made by high pressure, another weak link must be taken care of, namely, pipe lines. In this case the solution is either duplicate pipe lines, extra storage capacity or a water gas plant at a distant point. The latter should be avoided if possible, because when the water gas plant is started it means a change of fuel for all consumers, and adjusting every stove and mantle lamp in the territory. It will also require a raise in pressure if the distribution is through a master governor or low pressure mains. The ideal auxiliary arrangement would be ample pipe lines, one or two outside holders, and a large water gas auxiliary and large storage capacity at the coke oven plant.

Another point where the gas supply is the governing function, is the liability of failure of a single piece of apparatus to stop the whole plant. In a plant of 70 ovens or under, it is not feasible to build all the by-product apparatus, coke and coal handling machinery and power units in duplicate. The battery depends on the operation of the coal crusher and coal mixer, and at least three conveyor belts; a break down of any one of which means a shut down of the entire plant. On the battery itself, the machinery consists of a pusher, coke quenching car, larry car and a door machine for each set of ovens. A failure of any one of these means a shut down of the entire battery. In a plant of 70 ovens the investment for extra coal quenching cars is warranted. An extra pusher will cost too much; and besides, if the pusher broke down midway of the battery, an extra pusher could only reach half the ovens. However, spare parts for all machinery can be kept on hand. For instance, a pusher ram and leveler can be kept at the end of the battery, where they can be swung on to the pusher in a hurry. The by-products building must be at a little distance from the battery, requiring the two gas mains being carried through the air between the battery and the building. Each of these mains is then a weak link in the chain of apparatus. Throughout the by-product process, if the machines are put in sets of three and each machine by-passed, there need be no danger of shut down of the plant due to the failure of any one piece of apparatus. However, spare parts must be kept on hand, and the spare apparatus kept in the best of condition.

The production of naphthalene cannot be avoided, due to the high carbonizing heats, and it should be taken out of the gas in the plant. If the benzol recovery process is used, the naphthalene is automatically taken out. Experiments are now being made at the Coal Products plant to take it out with the tar. If the gas is distributed directly from the plant by low pressure, naphthalene stoppages become very serious; yard mains become filled some times in a few days. One of our outlet mains from the plant is an 8-inch pipe, supplying Joliet.

In 2 years this main gradually filled with naphthalene, and for possibly half a mile only a 2-inch opening was left through the center. In the high pressure mains the naphthalene is taken out with the condensation, so that no trouble has been observed. In order to get the condensation and naphthalene to drop near the plant, a temporary air condenser was installed, consisting of a loop of 8-inch pipe laid on top of the ground. This, with baffle tanks 8 feet long by 3 feet in diameter, has made it possible to condense part of the water in the winter time. Plans are being made to install condensers on the high pressure mains, making use of the water, so that the condensate may be taken out in summer as well as winter, and better than it is now being done.

Coke production in by-product plants has been the subject of some very valuable and interesting papers and it is not in the province of this paper to go over that field. However, the gas production cannot be separated from coke production, and the gas is really only a by-product from a very large industry.

In retort practice where the benches are fired with hot coke, the yield per ton of coal is about 10,000 cubic feet of gas and 1,000 pounds of coke. In a by-product plant, this yield is 5,600 cubic feet of gas and 1,400 pounds of coke. The coal gas plant produces 100 pounds of coke per 1,000 feet of gas made; a coke oven plant 250 pounds of coke. This means that the large increase in coke production must be handled and sold profitably. Assume that half the production of coke is sold for industrial and half for domestic purposes. The industrial coke will have a year round sale, the domestic coke a 5 months' sale. This means that about half of the coke produced for 7 months must be stored to recover later in 5 months. The coke handling apparatus must not only be ample for the daily production, but large enough to take care of the daily production plus the quantity to be taken from stock. The domestic coke is crushed and screened into two or more sizes. Assuming three sizes, egg, stove and nut, the proportions will run about three egg, two stove and one nut. This necessitates obtaining balanced coke orders, the orders each day should be in the same proportion as the sizes made, to do away with the necessity of stocking any size. The coke apparatus must be built with this balance of size in mind, that is, there must be ample car loading storage of all sizes, so that while one size is being loaded, the other bins will not fill up and necessitate moving the car while the other cars are switched in. As practically all of the coke is shipped in cars, an elaborate system of yard tracks is necessary. There must be storage for empty cars, and the tracks connected so that cars can be placed without unnecessary switching. There should be loading tracks on each side of the loading building, so that while box cars are loaded from one side, open cars can be loaded from the other.

The storage tracks for filling the cars must be arranged so that each car can be weighed and switched to the outlet track with minimum labor and time, and the coke tracks should not interfere with the tracks for incoming coal.

# REGULATION.

## The Granger Agitation.—Right of Eminent Domain.—Beginning of Regulation.—A Revolution Not Recognized.—Regulations Reach.—Our Responsibility.

[Address by the HON. W. J. CALHOUN at the banquet of the Illinois Gas Association.]

I had in mind when your invitation was first given me of talking about the relations between the State and public utilities, so-called, but the hour is getting late and the question is such a big one that I will only treat it in a very superficial way. Some of the things I had in mind have already been beautifully expressed by the gentleman who has preceded me. Your business is the manufacture and sale of gas and its by-products. Your plants represent the investment of quite a large capital. Their operation is the subject of private control. The profits realized or the losses incurred in the venture are enjoyed or borne, as the case may be, by the investors of this capital. Measured by the ordinary standards that obtain in the business world, your business might be regarded as your private business, subject to your exclusive control; but you perform a public service in the fact that you supply a public necessity, heat and light. You enjoy the privilege, the license of laying and maintaing your mains in the public streets of the city, a right which is not the same but closely akin to that of eminent domain. In most places you have a monopoly and are exempt from the ordinary law of competition, of supply and demand, in fixing the prices of your product. Your relation to the public is interdependent and intimate; that is, you supply the public with a necessity for its comfort, and the public in turn contributes to your financial rewards. Because of this intimate relation your business is classifid as a public service. Your plants are regarded as public utilities, and it is this blending of private and public interests in the same business venture that has given rise to so much discussion, to so much difference of opinion and conflict of interest, and to so much restrictive and regulatory legislation. In the consideration of this question I am impressed with the thought that in its varied phrases it is the biggest question before the American people to-day. You in the business are not such a large or disturbing factor in this problem, but you have a place in it and you cannot be indifferent to the result. I have no marked interest in it. I have a little gas stock and my great regret is I haven't more, but when the storm comes I get behind Rufus Dawes. I have seen the beginning, the development and expansion of this question. It was first developed in relation to the railroads. It began in the State of Illinois in what was called the Granger agitation. The State was very much excited, political parties were disrupted, men were turned out of high places and others went in on the wave of popular agitation of that time. It spread to Iowa and much the same popular demonstration took place there, and on the Stock Exchanges the railroad stocks of Illinois and Iowa were for a long time classified as Granger stocks. The railroads were built by private capital, and operated by the owners of that capital. The venture was attended in the beginning with great uncertainity as to financial success, because many of the roads were built ahead of the demands of use and some of them were entirely unnecessary. They had to wait until the country grew up, and the history of many of these roads has been that of successive bankruptcies, receiverships and reorganizations. The managers of these enterprizes, because it was private capital, honestly believed that it was their business and their right to manage it as they saw fit, regardless of public criticism. They overlooked two important facts; one, that the State had delegated to them the right to take private property for their right-of-way, which is the power of eminent domain and inherent only in the sovereignty of the State. Our Constitution, however, limited the exercise of that tremendous power by providing that private property should not be taken except for public use, and then only after due compensation was rendered therefore; and so when the railroads exercised the power, they had to do it within the spirit of the Constitution, and the road resulting from the exercise of that power became a public highway, and the public had an interest in it. In addition to that, to-day an organization or individual who assumes to serve the public must serve all on equal terms and on reasonable terms. A condition developed where all sorts of discriminations were practiced between individual shippers, and between sections of the country and between cities, so that some men went up and some went down without hardly knowing why or wherefor. Because of this tremendous grip on the fortunes of men in the discrimination of this great public servant—everything finds its reflction in public sentiment—an agitation developed which finally brought about the State commission for the regulation of rates, etc. The railroads, in the be-

lief that their property was private, resisted this legislation and it took its long and weary way through all the courts until it finally reached the Supreme Court of the United States. It was decided against the railroad companies, but the State commission had no power except over State commerce. It could only regulate and control commerce that began and ended in the State, because under the Federal Constitution, commerce between the States was under the exclusive jurisdiction of the Federal Government. Then resort was had to Congress, which resulted in the Interstate Commerce Act of 1884, a crude attempt to meet the situation. Following its enactment, that act was the subject of great controversy. It was analyzed and dissected. Every word was scanned, and finally it was decided by the Supreme Court that the Interstate Commerce Commission might decide that a given rate was too high and order it to be lowered; and by the same mental operation by which it arrived at the conclusion that the rate was too high, there would also be suggested what the rate ought to be; but it was held that under the act it had no power to name a rate to take the place of the one it disapproved. It went on that way for years and a condition of pandemonium developed among the railroads. Every traffic manager in the country was like a man fighting a duel in a dark room. He did not know from what side he would be struck, or who would attack him, and they found a condition of demoralization. Reference has been made to-night to my short service on the Interstate Commerce Commission. I saw the heads of all the great railroads of the country come to Washington and ask the Commission what could be done to help the situation. It seemed as though our whole people were being educated in the school of purjury, because it had spread all over the country affecting all business men and traffic men alike, in greater or less degree. The result was the present drastic, rigorous legislation which has practically deprived the railroads of the management of their property. They are not only subject to National regulation but to that of the different States through which they pass, and these are not uniform or consistent. I saw the other day in the newspaper a statement made by a President of one of the great Trunk lines in which he said that every time he ran a train from one terminal to the other he had to violate the laws of the States through which he passed, because they were not uniform and because he had to recognize the Federal law in preference to the State law. I take some satisfaction in seeing that in print, because I remember an interview with him years ago in which I told him that the condition of which he now complains was the inevitable unless something was done to check the drift of things at that time. I presume he has forgotten it, and wouldn't remember it if I spoke to him about it, but it would be a certain measure of personal satisfaction if I had that opportunity. When the movement was started it kept going, and it finally attacked you people. A demand came for municipal ownership in gas manufacturing and distribution, in street railway traffic, in water works and in many other avenues of public service. That fever raged for a long time. It seems to me so far as you are concerned it has subsided somewhat, but still the possibility lurks before and you may not be free from attack hereafter. But it is going still further. It has passed beyond the public service corporation and has finally placed its hand upon distinctly private business enterprises. That also resulted from a condition that probably necessarily brought it about. Men organized industries into great corporations that threatened, or were supposed to threaten, competition and create monopolies; and then the talk developed that wherever that condition arose the right of regulation followed. Therein by itself is a bigger question perhaps than yours, because this thing called competition, which is assaulted so much, has its evils as well as monopoly has others. Competition may be the life of trade, and yet in my judgment more hearts have been broken, more wasted lives have gone drifting down the stream of time into oblivion the victims of unlicensed, reckless, destructive competition. The law to-day takes no cognizance of that side of the problem, and the result has been all sorts of rates and legislation, until the business mind of the country is seriously disturbed. Now I think that the business men have their share of responsibility for this result. There was in the railroad management too much of the public-be-damned policy of administration, and it seems to me that many of our great business men fail to take into consideration what I would call the psychology of business, the human element to which our friend has referred. Some of these business organizations were too heavily capitalized. Great issues of stock were put upon the market; some men made fortunes almost in a night and attracted the attention of the country and excited the fears of the people. Owners of property, however, are as a rule conservative. They have something to lose, and therefore hesitate at anything that threatens disorder or social revolution; but they sometimes ignore the man who criticises conditions, and do not give him proper consideration. Some so-called crank, without property, without character, without anything practicable in his nature, appearing before a man of means and products and practical qualities, is apt to be regarded with contempt, and yet we may make a mistake. I have in mind that strange, mysterious character whom I look upon in the dim light of history with strange fascination, John Jacob Russeau of France. A very indifferent and even contemptible character he was in his private life. He lived on the bounties of his mistress. He allowed his children to go to the poorhouse to be cared for and educated. He was indifferent to every private obligation and to all personal friendships. And yet in that marvelous brain of his was forged a thunderbolt that was to strike the throne of France and smash it into fragments and stain those fragments with the tears and blood of men. Russeau's Social Contract was the inspiration of the French revolution, and his influence lives to-day in Europe. Carl Marks may be called the author of socialism, but his inspiration was derived from the social contract written by Russeau. So I am always willing to listen to any message that a man brings, not that I will follow it or accept it, but I will listen to it and not despise it. Now another word. I am not much of a stand-patter myself. I believe that no nation can stand still very long. It must go forward or it will go backward. We may reach a certain level of civilization and think we are safe, but sooner or latter the voice of destiny calls and we must pick up our burdens and advance stumbling and staggering to higher levels of achievement and of life. So in all these questions that are coming to us, we have to take into consideration their moral, their social, their political force and value.

One thing more I want to call to your attention briefly; that the political transformation that has resulted from this agitation began as high up as I have indicated. The fact is we Americans have passed through a political revolution and haven't realized it. When our forefathers formed the Constitution under which we live, two schools of interpretation developed soon after its enactment. One was the school of strict construction, which wanted a central government of most limited power, reserving to the States all powers not especially and plainly assigned to the Federal government. The other school was more liberal in its construction. Jefferson was the head of the strict construction school. The other day I picked up a volume of his letters. He was a great letter writer and he made but few speeches. He wrote many important State papers, but most of his political philosophy is found in his correspondence. I happened to open the book at a letter he had written a friend soon after the Constitution was adopted. In this letter he said that the duties of the National Government would be limited to foreign relations, leaving all other details of government with the States. Now we of the other school, of the liberal school of construction, are responsible for a great deal of the legislation to which I have referred. But this last two years we have seen our national Government go into the banking business and establishing currency; we have seen it build railroads in Alaska; we have seen it try to go into the shipping and transportation business, and under this Trade Commission Bill there comes a tremendous power of government the ends of which we cannot see and whose course we cannot measure. Now every business man, private or public, is the subject of investigation and inspection. An army of investigators are all over the country under the direction of the Interstate Commerce Commission. Another army of them are under the various district attorneys, and now another great army is coming directed by the Trade Commission. Your records will be examined, your account books will be investigated, every letter you write or receive will be read, and every detail of your business will be considered. Prices may even be regulated in what has been heretofore called private business. Now I am not objecting to this; I am not discussing its merits; I am simply like the man who stands and watches the clouds studded over the skies, wondering what their portent is, whether they foretell the coming of a great storm, or whether peace and sunshine lies behind them. I don't know what the ultimate end is to be. I am simply calling your attention to this revolution in political ideas and thought and practice, and the tremendous centralization of power in the National Government. It may be right. It may be for the best. The strange thing is that the disciples of Jefferson have been most active in bringing it about, in discarding every bit of politics that their patrons' sayings teach. What it means I don't know, but I am not alarmed. I believe all things will work out right, only it seems a time for serious thinking is here, and that is where the danger comes in. As to municipal ownership for gas, street cars, and similar things,

(*Continued on page 298*)

THE AMERICAN GAS LIGHT JOURNAL

Entered at the Post Office, New York City, as Second-Class Matter.

Published weekly at 42 Pine Street, New York City.

Telephone Call, John, 2996. Cable, Am-Gas.

E. P. CALLENDER, President.
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NEW YORK, MONDAY, MAY 10, 1915.

## Merchandizing the Issue!

What is the issue in the gas industry to-day, what do the leaders consider of paramount importance?

There is no conflict of opinion concerning carbonization. Hydrogen gas is not a competitor of enriched water gas. Distribution methods while not uniform gives satisfaction; and this applies with equal force to accounting methods. Appliances are of such good mechanical construction and design that operating troubles are always on a descending scale. The last feature is that of merchandizing, and here we must retrace our steps and join the kindergarten class in the business world.

The issue to-day is merchandizing. The most forcible illustration of this is in the papers and discussions at State conventions. Commercial topics predominate.

Several associations have "affiliated" with the American Gas Institute, but it is of the War Bride variety, as, from one year to another commercial topics rule the heart and mind of the locals.

It is well that merchandizing is the issue, because from much noise must come some good, and there's lots of room for improvement.

## The Engineer Needed.

The bill in the Texas Legislature providing for a public utility commission for that State specifies the qualifications of the members of the board, and provides that one must be a civil or mechanical engineer. Evidently the people are learning that regulation, to be of value to the public, must be founded on sound principles. The lawyer and politician must be guided right.

All governmental functions in this day have to do with engineering features, and the engineer is needed in legislative as well as executive capacity. In New York a State Constitutional Convention is in session, and a committee of engineers representing national and local professional engineering societies has sent a letter to the body suggesting that the technical developments of the period which has intervened since the present constitution was adopted have introduced into government large problems in connection with public works and utilities requiring legislation based on constitutional provisions.

Among the specific recommendations of the committee is the following:

A department of public utilities should be created to be headed by five commissioners appointed by the Governor, each to have a 10-year term of office so arranged that a vacancy will be created every two years. The commissioners should be eligible for reappointment, and at least two of them should be professional engineers in good standing in the profession. Each appointee should have had experience in connection with public utilities which would fit him for the duties of the office. At least two and not more than three commissioners should be residents of New Yory city. The department should regulate and supervise all common carriers, water supply, irrigation, drainage, gas, power, lighting, heating, intelligence-transmitting and other public utility corperations operating within the limits of New York State, including similar activities of any State department or political subdivision of the State. The department should be divided into bureaus, each engineering bureau administered by a chief engineer selected with sole regard to his peculiar fitness for the office, and he should have power, subject to the approval of the commissioners, to select and appoint division engineers for the propor conduct of his office.

We believe the time is ripe for such a change in New York, and have reason to believe that the convention will act wisely in the matter.

## Illuminating Engineering Society Elections.

With the printed ballots for the annual elections bearing the names of those recommended by the Boards of Nomination for general and section officers, the Council has sent a letter to members of the Society reviewing its nine years of usefulness and explaining the reasons for the proposed amendments to the constitution.

In 1906, when the Illuminating Engineering Society was organized, illuminating engineering as such was practically unknown, the principles and data of illumination had not been assembled as a separate body of knowledge, and there was not only lack of cooperation between those engaged in the various arts dealing with illuminating, but frequently their relations were sharply antagonistic and distinctly unfriendly. One of the most valuable purposes the society has served, and for which it has received generous credit, has been to bring together and enlist in the common cause of advancement of illuminating engineering as a whole, the elements that previously confined to their own respective coteries scientific and technical knowledge acquired, even though of general import. The great value of the society, through the work of its committees and as exhibited by papers and discussions printed in the transactions, has secured world-wide recognition, and directly led to the organization of similar societies in England and in Germany.

In its relation to similar bodies representing other branches of engineering, the society is laboring under a handicap that deprives it of the full recognition to which its objects and achievements otherwise entitle it—namely, lack of gradation in membership. Owing to the embryonic state of illuminating engineering at the date of the formation of the society, it was wisely concluded not to make a separation into grades, leaving it to the future to indicate the nature of such separation. The time now appears to be ripe to undertake that work, especially in view of the undesirability of longer deferring action to bring the society into conformity with the world-wide practise of sister bodies.

In providing for a gradation of membership another very important purpose calling for present attention can be served, provision for increasing the present inadequate income of the society. Several years ago the situation in this respect became acute, and was met by a constitutional provision for sustaining members, consisting of corporations, firms, associations, etc., interested in the objects of the society and desirous of contributing to its support. From this source about 28% of the income of the society is now derived; and while this aid has been given and has been received without in any way influencing the conduct of the body, it is obvious that instead of depending upon this means to meet increasing deficits in regular income, provision should be made whereby the society shall automatically be brought to a self-supporting status.

In this connection it is important to bear in mind that in nearly all societies having several meetings a year and issuing transactions, dues are much higher than in the Illuminating Engineering Society. The Society is very economically operated, but the cost of the transactions, committee work, and the large number of sectional meetings, together with the Annual Convention, is large, the total

expenses being approximately $8 per member. It is known that many members would prefer to pay in annual dues a sum at least sufficient to cover their own costs, and the proposed plan enables this to be done.

A committee of the Society appointed to consider these matters, recommended to the Council certain changes in the Constitution, and after careful consideration, the Council adopted for submission to the membership the amendments proposed, on which a ballot will be taken at the forthcoming annual election.

The requirements for transfer to the grade of Member are not onerous. In time the qualifications for that grade will without doubt be subject to further amendment, applying closer discrimination, but they are now made light in order to render eligible to transfer as large a proportion as possible of the membership, which has so loyally supported the society in the past. By the plan the present annual dues remain unchanged for Associate Members, while the dues for those transferred to the grade of Member becomes $10.

This circular to the membership has been prepared in order that they may have an opportunity to consider the objects of the proposed amendments well in advance of their formal submission for vote.

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### How Far Should Public Ownership Extend?

The Industrial News Bureau of Portland, Ore., says: "This is one of the vital questions before every community to-day. Even the most favorably situated municipalities are not making too great a success of public ownership of public utilities. It is admitted that public schools, streets and highways, water, sewers and public buildings are probable the limit. Many cities and even the United States Government find it cheaper to rent office buildings than build. The city of Seattle is probably as big a working illustration of public ownership as any city in the United States. That city's investments in power plant experiments have handicapped it with an enormous bonded indebtedness. Millions are still to be added to the city debt, already too large, for the costly experiment on Cedar River already inadequate. The city lighting department has charged the city 4½ cents per kilowatt for street lighting when a private corporation offered to supply it for 2 cents. For years the city has paid high rates in order to make more reasonable rates to private users, relying on tax levies to make up the deficiency. The city must now invest half a million merely to protect its storage site, and it may run into millions, while the Puget Sound Traction, Light and Power Company developed a 20,000-horse power unit recently for $400,000.

"One fact every community must consider—lights or water at rates lower than the cost of commercial production must be made up by the taxpayer. It stands to reason that political management of the public utilities will be expensive as compared with corporate management under proper public regulation. Beyond water supply, schools, streets and sewers no city should go in the direction of public ownership, and these four well managed will be found burden enough to carry."

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### Gas Range Week.

We have seen some comment on gas range week that was not altogether complimentary, but we believe that it was sufficiently observed and featured to make it an annual occurrence worth preserving. More companies will celebrate next year than this, because of the wider publicity given it. The most elaborate newspaper notice of "The Week" is undoubtedly that in the Philadelphia "Public Ledger," a whole page of the "Pictorial Section" of Sunday, April 25th, being devoted to illustrations of all-gas kitchens by the United Gas Improvement Company.

The National Commercial Gas Association rendered efficient help to all the companies that asked for it, and the trade journals also lent their influence to making it a success. A success it was!

[Official Notices.]

### Natural Gas Association of America.

Secretary's Office,
Delaware, O., April 1st, 1915.

The Tenth Annual Meeting of the Natural Gas Association of America will be held in Cincinnati, O., May 18, 19 and 20, 1915.

The President, Mr. James T. Lynn, of Detroit, Mich., will call the meeting to order on Tuesday, May 18th, at 10 A.M., in the Assembly Room of Music Hall, Elm Street, opposite Washington Park.

There will be one session each day, starting promptly at 10 A.M. until 3 P.M., with a 30 minute intermission for lunch. Therefore, punctuality is necessary; there will be no waiting.

The Mayor of Cincinnati, Hon. Frederick S. Spiegel, will welcome the Association.

Judge S. M. Douglass, of Mansfield, O., will respond to the address of welcome on behalf of the Association.

The following papers will be presented at the meeting:

"Equitable Rates for Natural Gas," by Mr. Donald McDonald, Louisville, Ky.

"Public Service Commissions," by Mr. James W. McMahon, Toledo, O.

"The Future of the Natural Gas Industry in America," by Mr. J. C. McDowell, Pittsburgh, Pa.

"Economical Construction and Operation of a Natural Gas Plant," by Mr. George W. Barnes, Los Angeles, Cal.

"The Use of Natural Gas at Domestic Rates for Industrial Purposes," by Mr. R. W. Burr, Columbus, O.

"Thirty Cent Natural Gas Melts Brass for Half the Cost of Coke."

"Gas House-Heating—Its Cost and Application." by Mr. F. R. Hutchinson, Cleveland, O.

There will be an elaborate and especially interesting exhibit of gas equipment in connection with the meeting under the auspices of the auxiliary association—The Association of Natural Gas Supply Men.

Every member of the Association who can possibly attend should make a special effort to do so; and gas companies are particularly urged to send as many men as can be spared, as the meeting will have a most stimulating influence on those in attendance.

T. C. Jones, Secretary.

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### Iowa District Gas Association.

Des Moines, Ia., March 22, 1915.

The Eleventh Annual Meeting of the Iowa District Gas Association will be held in Clinton, Iowa, May 26, 27, and 28.

The headquarters of the Association will be at the Lafayette Inn. Members are urgently requested to make early reservations. Mr. Thos. Crawford, General Manager, Clinton Gas and Electric Company, is Chairman of the Committee of Arrangements, and will furnish any information desired. Reservations may be made by communicating with the Lafayette Inn.

The following papers will be presented at the meeting:

"How can we Most Profitably Supercede Oil, Coal and Coke with Artificial Gas as Fuel in Industrial Plants?" by E. L. Lambert.

"Industrial Appliances," by W. L. Powers.

"Iceless Refrigeration," by Malcolm F. Ewen.

"Commissions and Financing of Gas Properties," by Andrew Cooke.

A symposium of short papers on:

"How to Spend Money to Make Money in the Gas Business," by H. C. Blackwell, H. B. Maynard, G. W. Clabaugh, G. I. Vincent, E. I. Lambert and W. H. Taylor.

The attention of the members of the Association is called particularly to the list of papers, which embody the most vital subjects before our industry to-day.

In addition, the following Standing Committees will report: Tar, Manufacturing, Distribution, Construction, New Business and Public Relations.

There will be a smoker and Dutch lunch on Wednesday night, a trip to Eagle Point Park, and an open air picnic meeting on Thursday, and a boat trip on the Mississippi river on Friday.

T. B. Genay, Secretary

(*Continued from page 295.*)

**Regulation.**

I have no objection to it except one. The query in my mind is whether our people are developed to the point where we can have the efficiency of administration that the public needs; and that I doubt very much. And this one other thought; the great problem we are working with is democracy. We, it seems to me, accept it as established and yet I think we are now approaching the most difficult part of it, with all these complications confronting us. One of the great lessons I have learned was when I saw the oldest monarchy in the world sicken and die. I saw its death struggle. I heard its death cry. A monarchy that ran back until its history is lost in the mists of dead centuries, and there it was dead in my presence. I saw the young Republic rise to take its place, bathed in tears and blood that were shed in struggle. I saw it attempt to meet the responsibilities of the situation with a people who neither understood nor appreciated the responsibilities, the rights and the privileges of the citizenship in a Republic; and I saw, as never before, that you can't make a given form of government to order and go and fit it to a people, regardless of their moral and social and intellectual development. Mexico never had a Republic and never can be a Republic until her people reach a higher level of life.

We men of to-day and to-moroow who must deal with these great questions if we would keep our Republic intact and have it maintain its place and its influence in the world, must realize as our population increases, our wealth increases and the divisions between the rich and the poor increase and all the complicated social questions develop, that we need a still higher and ever advancing standard of citizenship to meet those responsibilities, and to see that the sacrifices of the past are not lost by the follies of the future.

## Domestic Uses of Gas.

[From the paper read by J. H. GAYLORD before Pennsylvania Gas Association.]

It would be quite some task to write upon every use of gas for domestic purposes, so I dwell upon only some of the important phases of this end of the business that should receive the very close attention of gas managers. Any paper that does not call out adverse discussion might be considered a failure, so I am going to talk plainly; and I hope if I happen to hit rather hard at some of my brothers in the gas fraternity, that you will remember I am still ready to be convinced if I am wrong. The convention floor is the place to express your thoughts, be they pro or con, so I ask that those of you who have had experience along the suggestions offered, get on the floor and tell them. It is the thought of the writer to re-echo, in some cases, thoughts and suggestions given by some of the fore-sighted gas men in our conventions of past years, but which have been passed over with little attention.

The All Gas Kitchen is the most important use to which gas can be applied in the home, so let us consider our duties toward developing this part of our business.

It is always necessary when going into battle to know what you are fighting for, what you are fighting against and how you can defeat your adversary at the least cost. How many managers know how many coal ranges are in the territory covered by their mains, where they are located and what their consumption of coal is per year? How many hot water systems are in the homes and how many depend upon parlor stoves for house heating? How many coal ranges are being annually installed, either as renewal or as entirely new installations? What profit is the hardware merchant making on coal stoves, and would he be willing to consider a proposition to push gas ranges if the gas company would stop cutting prices and become a merchant?

A great many gas managers are not merchants. You can get just as much profit on the sale of a gas range as on a coal range. I know this, because I know some that are doing it. In my opinion you are educating the people wrongly; you are educating them to expect everything for nothing, and you are the sufferer. If you must cut prices, do it by special sales, but do not make a practice of trying to break even. If you would have your consumer appreciate the value or quality of your appliances, you can best do so by placing the same selling price on them that any merchant would need to get to enable him to continue in business. The hardware merchant makes his money by the mercantile sales he makes, and you cannot expect anything but a bitter enemy when you take this profit from him. Why not have every hardware merchant and plumber for a friend, for an ally, and then you will have the assistance of real salesmen free gratis? Remember the hardware merchants are established and are here to stay, so get them on your side and notice the difference in feeling of your consumers toward you. On the contrary, any cupidity shown by your gas company in the sale of appliances is causing a positive loss in the gas sales. Is not every house a gas range prospect? Should not every kitchen be a gas kitchen? If this is true, it seems that right here is one trench you will have to capture to make your success complete. Of course, where no heating plant is in the house you should show the prospect a combination gas and coal range. (You notice that I put "gas" before the "coal.") Too often the gas manager leaves this end of the business to the hardware merchant. Very good. But what are you doing toward educating the hardware merchant as to how a good combination gas and coal range should be constructed? Too many times he sells a $\frac{3}{4}$ coal and $\frac{1}{4}$ gas attachment. Picture a gas attachment with three burners on the cooking top, parallel to two 8-inch coal cooking lids, so close together that when three ordinary 8-inch cooking vessels are put on one gently slides off on the floor. You should not allow any more of these ranges to get into your territory. for, as far as gas is concerned, they are a failure, and people purchasing them will become so bitter against the gas attachment that they will make very poor gas consumers. Also picture a gas baking oven so narrow that when it becomes necessary to use a roaster the coal fire must be lighted, with the result that you perhaps lose several days during the summer, good gas days, for when a coal fire is once lighted it is seldom allowed to go out until the summer heat practically forces the housewife to let it go out. But there are several fifty-fifty gas and coal ranges made, that are sold at such reasonable prices that you can afford to handle them, as can any merchant. Perhaps as a suggestion, it might be a good thing to have your hardware merchant consult you upon the relative value of various makes of combination stoves, before going into this line strenuously. Another reason for the capture of Fort Hardware.

A water heater campaign is very nice, and brings in large sales, but these campaigns are not a success if they do not carry with them the educational feature. How many years are you to struggle along on special sales campaigns at no profit, when you could cover the same field at one-fifth the cost by a combined educational and sales campaign with assured increase of gas output and a nice profit on all year appliances. A good article properly sold stays fixed as a constant revenue bringer; improperly sold by commissioned salesmen it means nothing to the credit of the gas industry. The hardware merchant is not the only obstacle we have to overcome. This educational feature looms greater to the writer every day, as I have proof of its value. I would rather see a gas range intelligently bought than cleverly sold.

A domestic science expert who has been taught how to educate and handle all classes of women, able to converse in foreign languages for some territories, who can survey your consumers' needs along gas cookery educational lines, if unrestricted in her work will bring you immediate results in gas consumption. She should be on your pay roll the year around, that she may be in touch with your conditions at all times. Such an instructress will be worth far more to you than an industrial expert. This is no supposition, but a fact from experience. You little realize the number of appliances on your mains not in use, or used only in part, that such an instructress will get working, much to the benefit of your monthly reports. What do your think of a gas company that found a demand on their lines by such an investigation of three times the capacity of its plant? Let us consider how this instructress can better conditions. In the first place, gas is cheaper than coal for cooking and water heating. (I am not going to add any "ifs" for that word does not belong in the gas business.) Anyone can, by the use of Blank Fireless Cookers, Aluminum Triple sauce pans, combination egg poaching sets, combination steamers and roasters, double frying pans, and a good circulating water heater and the proper domestic training, defeat for cost any coal installation known. We have proven this to our own satisfaction, and to the gentlemen from Missouri, we would say, consider roasting a 5 pound chicken. In the special roaster and gas oven you will consume 15 feet of gas to roast it; and with coal at $4.50 a ton, it would cost at least 11$\frac{1}{4}$ cents. Then by using the triple sauce pans on range top you can prepare the balance of your dinner at a cost of .022 cents. Example:

*By Gas.*

| | |
|---|---|
| Combination roast (chicken and potatoes) | .015 cents |
| Triple sauce pan (peas, corn and asparagus) | .015 " |
| Coffee | .007 " |
| Hot water | .004 " |
| Total cost by gas | .041 cents |

*By Hard Coal.*

| | |
|---|---|
| 25 pounds fuel | .057 cents |
| Balance in favor of gas | .016 cents |

Of course, it might be said that you can also use a fireless cooker with coal. That is true, but when you take into consideration the low cost of gas fuel, you should have no trouble eliminating the coal range, for it must be used just as hard to take care of the two vessels on its cooking top and the hot water front, as when the fireless cooker is not used. Then you have the usual argument of constant service to the burner, quick heat, sanitation, labor saving, as well as a saving in cost of labor for domestics. Many housewives would willingly do away with one servant if their kitchen maid was not confined to the kitchen so many hours. This seems to be another point of attack for a gas kitchen.

Again I cannot overlook what bids to be a contending factor before we can expect eternal peace; the "Do it by Electricity" man. We all are familiar with the fact that there are some electric cooking appliances that are giving fairly good satisfaction considering their early development; and that some have been a great success as a campaign appliance, thousands being used in homes in spite of the fact that if gas were used in the same appliance it would cut the cost of fuel 80%. Do you know how they do it? Some of us do, I am sure. They do it by progressive, aggressive advertising. They employ past masters in the advertising line to take care of their publicity work, and the manufacturers are doing a great deal of work that the central station man can be thankful for. Suppose such an aggressive campaign on electrical cooking appliances. Would not the gas man have a fairly formidable enemy to combat. The electric interests are in training for the day when they can come out with the proper appliance, and it is up to every gas man who expects to see universal gas kitchens to get busy. There should be a co-operative spirit between the manufacturer and gas company at once to develop a publicity campaign. It should not be neglected another day. You are going to have this competition the same as you have lighting competition. Are you going to get busy or wait until the other party is fully mobilized? Why go out of this meeting without endorsing the National Advertising Campaign, if only your moral support to the committee of the National Commercial Gas Association covering this work? Remember it is money that talks, and you must not expect the manufacturer to support a National Campaign when you do not support your National Association in a similar campaign at a price to each company of only one mill per thousand sold. We should at once get acquainted with the best advertising talent in the country and start something, for it will take some time to get going. Do not send in your money to-day and then go down to your office in the morning expecting to find your doorway crowded with prospects. I daresay that I run into a mazda lamp ad. every day, somewhere If the same were true of gas you would soon develop an impression upon your prospects that would eventually turn them into gas consumers. As advertisers, we are lax.

Too much praise cannot be given the manufacturers who have been developing lamps for household illumination. Great strides have been made in the past few years, and we now have gas semi-indirect fixtures that cannot be beaten for beauty or for cost of lighting. And I believe that we should all express our opinion on the subject of Free Maintenance. Mr. Pierce has covered that subject in his paper, but I wish to state that I am in faver of free maintenance of all appliances on condition that you can be assured by contract a specified consumption in return for this gratuitous service. We are using a contract in Hazleton that reads as follows:

FREE MAINTENANCE CONTRACT.

THE LUZERNE COUNTY GAS AND ELECTRIC COMPANY.

Hazleton, Pa., 1915.

You are hereby authorized to install 1 five burner gas arc lamp in my place of business, situate at No. 10 Broad street, Hazleton, Pa. For the use and maintenance of same I agree to consume at least 1,000 cubic feet of gas per lamp per month, except for the months of June, July and August, of each year. I further agree to pay you for gas consumed each month at your regular rates.

It is further understood that said lamp shall remain the property of your company.

Witness, JOHN BROWN.
WILLIAM HEPNER.

This form of contract of course requires a special ledger that you may check up the lamps so maintained, that the minimum may be charged to every consumer that does not consume gas to the amount of the contract. This ledger could be made to combine your arc record with your contract record, facilitating the work of the office force. A similar contract could be used on free maintenance of house lights, only the consumer should be required to install burners of approved quality, after which the gas company would maintain the light, supplying all repairs. This maintenance cost would be very small considering the additional gas consumption, and you would get, as well, satisfied consumers. The new upright Kinetic Burner would be the logical burner to receive this free maintenance, on account of its non-blocking qualities and low cost of mantles and glassware.

Every house should be piped for lighting. Particular attention should be paid to the showing and selling of high grade gas portable lamps and domes. It is a fact that over two-thirds of the lighting in the home is by the table lamps and dome. And if the gas man gets only this business tucked under his coat, he can feel highly elated. Combination fixtures of good manufacture are to be desired, and no gas man should let his pride get the better of him so far that he cannot bear to see a combination fixture installed. If you believe gas cheaper than other forms of illumination, why be afraid of comparison? The gas light is better for quality of light, and if maintained free you should hold this business without any trouble.

I could go on for a week talking about every gas appliance made and tell you its advantage, but I have already given you points enough, that if followed out will result in good substantial increases in your yearly revenue. Of course, it should be unnecessary to tell you that a beautiful display room has a great deal to do with the impression you create upon your consumers. Yet we find in going around the country that gas companies pay as little attention to this end of the gas business as ever. Remember you are not merchants until you display your goods as other merchants display them. A thousand dollars will do a good deal toward fixing up a fine display floor, the cost of which should come back a great many times through increased trade. By putting in good oak cases, showing gas percolators, chafing dishes, coffee machines, hot plates and all kinds of good guaranteed alluminum ware, nickel toasters and frying pans, etc., you will get the trade in the habit of coming to your display room, and by so doing you will develop a great deal of good mercantile business.

Be boosters. Get busy and hustle and get the proper spirit.

## Determining the Benzol in Gas.

[An abstract translation in the London *Journal* of a paper by DR. A. KRIEGER.]

The Chemist's Committee of the Association of German Ironmasters reported that it was desirable that an exact method of determining benzol in gas should be worked out, since there was at present no such method available for the examination of coke oven gas. Most of the methods hitherto described have applied to the coal gas of gas works, which contains considerably more benzol than coke oven gas, and these methods are more suitable for scientific than for works laboratories, where the greater part of the work is carried out by untrained men. Further, gas works attach little importance to the continuous testing of the gas for benzol. By benzol in this connection is understood the total of the compounds of this group, including benzene, toluene. xylene, etc.

Methods of benzol determination may be divided into two groups—those applicable to small quantities (viz. 100 c.c. to 10 litres of gas) and those applicable to 5 cubic feet or more. The method of inferring the benzol content from the specific gravity of the gas is included in the first group. It presupposes that the gas has a definite composition, and in practice is more tedious than other methods. Another method which requires but little gas is the absorptiometric method of Dennis and O'Neill, which has been improved by Ellen S. McCarty. Nickel nitrate, or nickel cyanide, is used for absorbing the benzol; but the method is not very suitable for coke oven works, because it depends on exact gas analysis,

and because of the small proportion of benzol in coke oven gas. For instance, the benzol in the crude gas from Westphalian coal corresponds with about 1% by volume, and in the extracted or washed gas to about 0.07%. Using a measuring vessel of 100 c.c. capacity 1% on the benzol would correspond with 0.01 c.c. of benzol vapor, and with ordinary laboratory apparatus it is impossible to work closer than to 0.05 c.c. Thus the absorptiometric method would invoice an error of at least 10%. As an extraction of 90% of the total benzol is ordinarily guaranteed, it would be impossible to ascertain by such a method of analysis whether the guarantee was properly fulfilled.

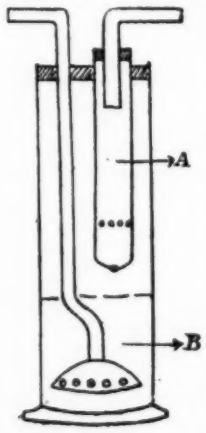
A similar method of working is that of Bunte and Haber, in which benzene and ethylene vapor are determined by means of bromine water. The ethylene is brominated, and benzene is soluble in the product of bromination. The ethylene is estimated from the consumption of bromine ascertained by titration, and the benzene is found by difference. This method is quite good for coal gas from gas works, but for coke oven gas it does not give equally trustworthy results, since the heavy hydrocarbons do not total more than about 2.8%.

The method of nitrating the benzene takes a middle position in regard to exactness. Harbeck and Lunge nitrate about 10 litres of gas and weigh the nitro-benzene after drying it at about 80° C. or over concentrated sulphuric acid. Losses are inevitable by this procedure, since nitro-benzene is readily volatile. If the drying is done in a vacuum the determination is too slow, and becomes of little value for works-control purposes. Pfeiffer nitrates in a separating funnel of about half-a-litre capacity, which volume, with washed gas from coke ovens, would yield only 0.025 gramme of nitro-benzene, which is too small a quantity for exact work. Sainte-Claire Deville separates the benzene from about one cubic metre (35.3 cubic feet) of gas by cooling it to —22° C. A disadvantage of this process is that the benzene is not completely extracted, as at this temperature 23.5 grammes of benzene remain in a cubic metre of gas. In crude coke-oven gas, however, about 4 grammes of benzene per cubic metre have to be determined and in the washed gas still less. Owing to the tension of benzene vapor at —22° C., and the difficulty of maintaining apparatus at that temperature for six or eight hours, this method is of comparitively little value. A method somewhat similar that has been proposed, is to saturate the gas with benzene vapor by passing it through a saturator containing benzene, and from the quantity of liquid benzene taken up, calculating the quantity of benzene vapor necessary for the saturation of the gas. Only ten litres of gas are used by this method, which is therefore not suitable for the work under consideration.

Müller has used a method of absorption with cooled paraffin oil, which Nowicki modified by altering the form of absorption vessel in order to secure better contact of the gas and absorbent. The author has studied this method and introduced a modification of the apparatus, which extends its range of application and makes it suitable for coke oven works. It is not necessary to use paraffin oil, as good results may be obtained with tar oil; but the freedom from color of paraffin oil is in its favor. The author determined the quantity of benzene absorbed by 50 c.c. of oil in the washing flasks employed. He found that, when cooled to —18° C., 50 c.c. of the following oils absorbed from gas the weight stated of benzene: Tar oil boiling between 170° to 205° C., 3.5 grammes; tar oil boiling between 240° to 270° C., 4.5 grammes; tar oil boiling between 260° to 340° C., 3.2 grammes; and paraffin oil boiling above 300° C., 4.6 grammes. In determinations, however, these limits of absorption should never be attained. In the author's investigations more than 0.8 gramme of benzene was never absorbed in the first flask.

A point of practical importance in regard to the washing oil is that an oil which of itself yields much light oil on distillation contaminates the benzol distillate and makes it difficult to work-up, but this, of course, applies only to the first time of using the washing oil. The most suitable washing oil is one which yields at the most 10% of distillate below 200° C., and at least 90% of distillate below 300° C. The best tar oil for washing is one which distils between 240° and 260° C.

The author tried various forms of absorption apparatus, most of which allowed some of the oil to be carried forward by spurting or as spray. After many trials, he finally adopted the washing cylinder shown. This has a height of about 9 inches, and a diameter of 2 inches. It is charged with 50 c.c. of the washing oil (*B*). The outlet tube (*A*), packed with glass beads about 1-12th inch in diameter, is 6 inches long and ½-inch diameter inside. There is a small hole in its bottom, and about ½-inch from the bottom is a ring of small holes for the inflow of the gas. This tube is closed by a cork, with glass outlet tube that connects it with the next cylinder. In use, mechanically sprayed oil is completely retained in this outlet tube owing to the obstruction of the beads. Two absorption cylinders serve to absorb the benzol completely from the gas, though in the author's investigations three cylinders charged with oil and one packed with cotton wool were used. The cylinder containing cotton wool was used for many months without showing perceptible alteration in weight. Hence for practical purposes it was found that the third cylinder charged with oil and the one packed with cotton wool could be dispensed with. The first cylinder ordinarily absorbed about 0.8 gramme of the benzol, and the second cylinder not more than 0.05 gramme.



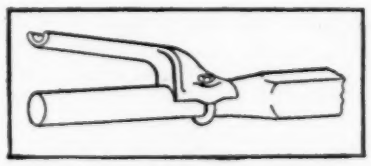

With a view to securing further simplification, experiments were tried with cooling and without the use of paraffin oil, and on the use of paraffin oil without cooling. In the one case the empty cylinders were cooled in ice at a temperature of about—18° C., and it was found that only a small proportion of the benzol was extracted from the gas. Working with paraffin oil without cooling gave a rather higher extraction; but a long series of experiments showed that both absorption and cooling are necessary to ensure the exact determination of the benzol in gas in a simple manner. A balance weighing to 0.01 gramme on a load of 5 kilogrammes is sufficiently accurate for the purpose, and the determination may be carried out by anyone capable of using the balance. In order to avoid errors due to the difference in weight of more or less air or gas in the cylinder, the air in it is displaced by dry gas before the first weighing; and after the absorption the cylinder is brought to the room temperature with one of its connections attached to a low pressure gas supply and the other connection closed—a drying tube being interposed between the gas supply and the cylinder. The weighings before and after absorption are then comparable. About 40 litres of gas are passed through the apparatus per hour; hence when determining the benzol in gas which has passed through oil washers on the works the test extends over about 8 hours.

It may be assumed that the process effects a determination of benzol in gas which is to all intents and purposes quantitative. When 5 litres of the washed and cooled gas was nitrated with a mixture of sulphuric and nitrate acid there was no smell of nitro-benzene. Bauer has shown that 0.4 volume of benzol vapor in 10,000 volumes of air can be detected on nitrating by the smell.

An objection to this method of determination is that it involves the use of ice, 2¼ pounds of ice being necessary for one determination. The process, as described, makes it possible to determine benzol in quantities of only 2 grammes per cubic metre (874 grains per 1,000 cubic feet) of gas. The method is sufficiently simple and convenient for use in works control, and as the recovery of benzene and its homologues (toluene, etc.) from gas is now becoming a matter of considerable importance, such a method of determination is likely to be of service in securing good results from the washing plant.

## Knuckle Guard a Possible Hazard.

In the JOURNAL of April 26th we illustrated this knuckle guard for wheelbarrow handles, recommended in a Bulletin of the National Founders Association.



It has, however, not proved entirely satisfactory. Mr. J. B. Douglas, Chairman of the Institute Committee on Accident Prevention, writes as follows:

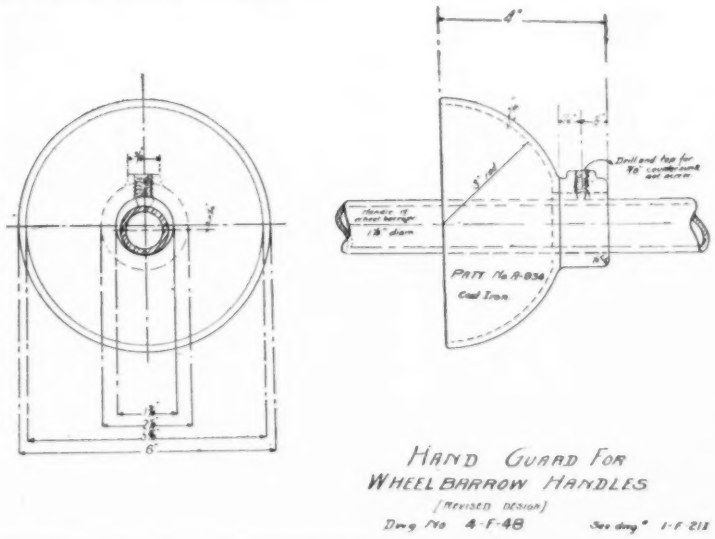
"My attention has been drawn to 'New Methods and Appliances,' page 269 of the April 26th issue of the JOURNAL, wherein a metal 'knuckle guard for wheelbarrow handles' is illustrated.

"The knuckle guard designed appears also to serve as an accident hazard, and I write to draw attention to an experience with a similar guard reported by one of our members:

"'A laborer was wheeling a barrow of oxide into a purifying box, and as he dumped the load into the box the metal knuckle guard with which the barrow was equipped, due to the tilting of

the barrow in dumping, caused his hand to become so tightly wedged between the handle of the barrow and the guard that it was impossible for him to release it without injuring his wrist or falling. Other employees rushed to his assistance and prevented an accident.'

"Since the experience above-mentioned a bell-shaped metal hand guard, along the lines illustrated on the attached sheet, has been designed by Mr. Gartley's office. I might state that a very heavy leather guard has also been recommended. The latter, of course, does away with all rigidity."




HAND GUARD FOR WHEELBARROW HANDLES
(REVISED DESIGN)
Drwg No 4-F-48 See drwg # 1-F 211

## New Methods and Appliances.

THE EASTMAN COAL GAS BENCH CONTROL.—Mr. J. P. Eastman, Superintendent of the Manitowoc (Wis.) Gas Company has applied for a patent on a combustion device for coal gas benches.

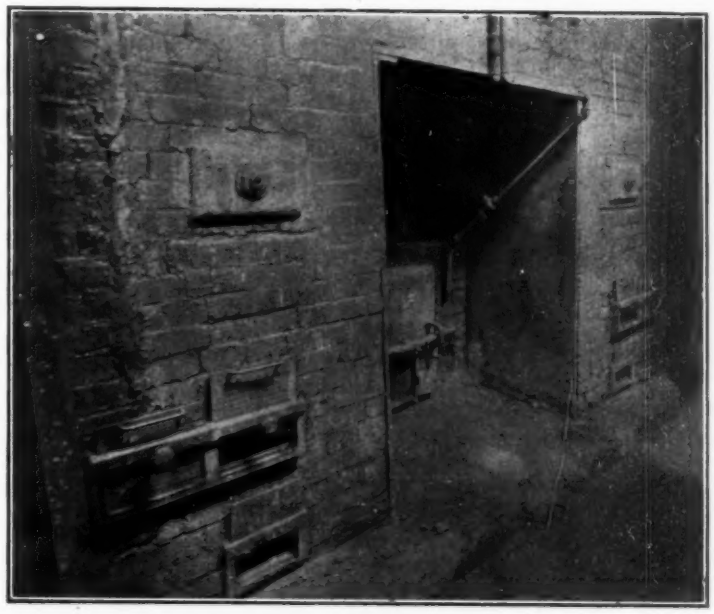
"Gas benches of this type are provided with two sources of air supply, the first admitting air directly beneath the grates of the furnace and the secondary supply admitting air to the combustion chamber at about the level of the bottom retorts. The primary air supply is insufficient to effect complete combustion, merely producing CO, the secondary air supply operating to effect complete combustion of the gases around and directly in contact with the retorts which contain the coal to be carbonized, the CO taking on an extra atom of oxygen, converting it into $CO_2$. In order that the secondary air shall not appreciably reduce the temperature in the combustion chamber and will combine readily with the CO therein, the secondary air is preferably heated to a degree approximately that of the gases in the combustion chamber; for which purpose the waste gases from the bench are utilized in connection with a usual form of regenerative furnace located between the combustion chamber of the bench and the stack flue.

Detail of Draft Openings and Slides.

"The air supply openings, flues, stack, etc., are figured to produce the greatest efficiency for the designed normal capacity of the bench; and to adjust or regulate the furnace to meet varying conditions, the almost universal practice has been to vary the sizes of the primary and secondary air supply openings and the draft of the stack, by means of dampers. This is objectionable for the reason that it is very difficult, in varying the sizes of the various openings and passages, to preserve the relation corresponding to the greatest efficiency of operation. Attempts have been made to overcome this by the use of mechanical devices so expensive as to be practically prohibitive, and, moreover, they have been only partially successful.

"I have discovered that uniformity of operation in gas benches of this type can be effected without the use of dampers and without trottling or otherwise varying the sizes of the air supply openings and of the stack flue, that is without the use of dampers applied to the air supply openings and stack flue. This end I accomplished by providing a controlled opening which connects the passageway or flue for the discharge of the waste gases or products of combustion with the outside air; the opening being preferably located at the base of the stack, and by its means the draft of the stack may be adjusted to various operating conditions.

"Instead of regulating the bench by means of dampers in the waste gas flues and in the stack, I control the furnace entirely by providing means for 'breaking' the draft of the stack, preferably consisting of a slide plate controlled opening in the discharge flue of the bench. at a point beyond the combustion chamber, preferably at the base of the stack.



Benches Equipped with Eastman Control.

"I preferably insert a thimble in the wall of the furnace adjacent to the base of the stack, the opening controlled by a suitable slide-plate, by means of which the opening may be entirely closed or adjusted to any desired size.

"By actual use I have demonstrated that by means of this improved construction I am able to reduce the quantity of fuel used in the furnace from 25 to 30%, or, to express the saving in pounds of fuel coal per ton of coal carbonized in the retorts, I have reduced the quantity of fuel used from approximately 400 pounds per ton of coal carbonized in the retorts to from 280 to 300 lbs."

The device has been in use on all the benches in Manitowoc for more than a year, and on their newly refilled benches is showing even better economies than the figures quoted above.

RAPID ENAMELING PROCESS.—An enameling process in which quick-drying is secured by heating in gas ovens under a high percentage of humidity, has been perfected by the Fickling Enameling Corporation. By this method an automobile can be refinished in 3 days. After the initial enamel has been applied either by dipping or spraying, the parts are placed in specially constructed ovens and dried. Thermostatic control keeps the temperature between 110 and 120° F., and water control regulates the humidity at about 40% of saturation. Where the character of materials allows, the temperature is increased to as much as 200°, and the final enamel is subjected to a similar baking at a slightly lower temperature.

Drying in the ovens with constant relation of temperature and moisture and the use of water-washed air is said to secure more lasting enamel than is possible by ordinary air drying.

## ITEMS OF INTEREST FROM VARIOUS LOCALITIES.

COLONEL CHARLES F. SPAULDING, gas expert and inventor, died last week in Waltham, Mass., at the age of 86 years. He was a native of Franklin, Vt., and when a young man went to Burlington, where he become superintendent of the gas and water works system. A few years later he moved to St. Johnsbury, where he was superintendent of the tin department of the Fairbanks Scale Company. Early in the Civil War he organized the 16th Regiment of Vermont volunteers, was given the rank of Major, served throughout the war and was for years Colonel in the Vermont militia. In 1872 Colonel Spaulding returned to his former home in Burlington, Vt., and in 1877 became Superintendent of the gas works in Brookline, Mass. He moved to Waltham 25 years age and was Superintendent of the Waltham Gas Company until 7 years ago. Since then he has been Consulting Engineer of the Newton and Watertown Gas Company. Colonel Spaulding was an Honorary Member of the New England Association of Gas Engineers and of the Guild of Gas Managers.

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THE price of illuminating gas in Tonawanda and North Tonawanda, N. Y., has been reduced from $1.50 to $1 per 1,000 cubic feet, beginning May 1st, according to the announcement made by the Niagara Light, Heat and Power Company. This reduction makes the price of illuminating and fuel gas the same.

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C. M. KELLER, of Columbus, Ind., who manufactures coke crushers and drip boxes, besides being an officer of the Columbus Gas Light Company, has returned from a 12-weeks' cruise around South America. He says his time was so short that he did not have opportunity to visit all the gas plants.

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FEATHERSTONE & Co., Madras, India, want catalogues and export prices of mantles and gas burners made in the United States. They have written the JOURNAL asking that we make their wants known.

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AN action in equity seeking the forclosure of mortgages has been filed in United States district court against the Buffalo Gas Company, with the New York Trust Company as complainant and petitioner for the appointment of a receiver to take over the business of the company, which has been in the hands of receivers for several months. The action that resulted in Alexander C. Humphreys and Harry T. Ramsdell being appointed receivers was begun in September of 1914 by the Pintsch Compressing Company of New Jersey. The Pintsch Company and the present receivers are named as co-defendants in the action just started. Bond issues, stock certificates and real estate aggregating $15,000,000 are involved.

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THE City Property Committee of Springfield, Mass., awarded the contract for 48 gas stoves for the High School of Commerce to the Springfield Gas Light Company at $13.25 per stove. Samples were submitted by several local concerns and the committee decided to buy the one offered by the Springfield Gas Light Company.

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ROGER W. POLK has been appointed by the Public Utilities Commission of the District of Columbia, to act as gas engineer for its Bureau of Valuation. The Commission is engaged in an examination and valuation of the manufacturing plants and distribution systems of the Washington Gas Light Company, and the Georgetown Gas Light Company.

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THE D. R. Russell Engineering and Development Company, St. Louis, Mo., announces that it will continue to follow closely the policies established by the late Mr. D. R. Russell the founder of the business, and will develop the business along lines mapped out by him, making only such changes as may from time to time seem advisable to increase the efficiency and value of the services they offer their customers. Mr. Russell's place as active head of the organization will be filled by Mr. George W. Parker, who has for the past 15 years been associated with the Parker-Russell Mining & Manufacturing Company. The following are the officers of the Company: J. L. Green, President; George W. Parker, Vice-President and General Manager; F. G. Curfman, Vice-President; Irwin Rawson, Secretary; R. D. Hatton, Treasurer; Vernon Baker, Chief Engineer.

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ON March 30th the new works of the Ottawa (Ontaria) Gas Company were put in operation. A few days later the old works were shut down, and since then all the gas supplied has been made in the new vertical retort plant.

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ONCE more is Hanover St., from Elm to Chestnut, glaring with light, living up to its name of Manchester's (N.H.) Gas White Way. After a long period of comparative darkness, arrangements have been made between merchants in that busy street and the Peoples Gas Light Company, whereby the lights will burn another year. A contract to this effect was signed the first of last week, merchants having realized that Hanover street is a better business street when better illuminated. The lamps have not been lighted since the last week in 1914, when a 3-year contract expired. An effort was made to induce the city to take over the special lighting of this street, but the Mayor and Aldermen were not dispossed to assume the responsibility.

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THE fourth reduction in the price of gas put into effect by the Tampa (Fla.) Gas Company within the last four years is announced. The reduction is 10% from the present rate. The others were made in December, 1911, April, 1912, August, 1913, and now May, 1915. The new rates in effect May 1, are as follows:

| | | | Discount | |
|---|---|---|---|---|
| Minimum .... | 700 cubic feet | $1.11 | $.11 | $1.00 |
| First ..... | 1,000 " " | 1.60 | .16 | 1.44 |
| Next ..... | 5,000 " " | 1.50 | .15 | 1.35 |
| Next ..... | 10,000 " " | 1.40 | .14 | 1.26 |
| Next ..... | 20,000 " " | 1.25 | .12 | 1.13 |
| Next ..... | 40,000 " " | 1.11 | .11 | 1.00 |
| Next ..... | 80,000 " " | 1.00 | .10 | .90 |

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MATERIAL for the new gas making machinery to be installed in the plant of the Carbondale (Pa.) Gas Company has arrived, and work of erecting the plant will be commenced immediately, according to Manager A. B. Sheer. The new machine will quintuple the present capacity of the company. The company is expending $20,000 in improvements, including the new machine and new mains that are being laid.

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OFFICERS of the Gardner Gas Light and Fuel Company recently met the directors of the Gardner Business Men's Association, and when the conference was over, the Gardner men had obtained gratifying concessions from the Boston gas magnates. Among the things conceded, in addition to the 10-cent reduction in the price of gas, is the election of two members of the business men's association to the directorate of the gas company. The agreement also provides that any surplus over operating expenses, interest on investment and depreciation of property for the fiscal year to end June 1, 1916, will be rebated to the consumers in proportion to their bills, and officials of the Business Men's Association are authorized to audit the books. The gas officials pointed out that co-operation on the part of the Business Men's Association is necessary if the company grants such concessions.

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AT the last regular meeting of the Service Club, which is composed of the employees of the Williamstown (Mass.) Gas Co., Adams Gas Light Company and North Adams Gas Light Company, in addition to the regular routine business, the club was entertained by John J. Quinn, secretary of the Employees' Association of the Pittsfield Coal Gas Company, who gave a talk on Public Service Associations. After Mr. Quinn had finished, his paper was taken up for general discussion, after which refreshments were served. It was announced at the meeting that the Saturday half holiday for employees would commence the first of May. The May meeting of the club will be a "Question Box" meeting. Each member is to submit a question that he desires to hear discussed.

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THE Malone (N. Y.) Light and Power Company, is making rapid progress toward the completion of the improvements at the gas plant. The new bench is ready for operation and has been given a trial test.

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MANAGER W. F. CLAUSEN of the Winona (Minn.) Gas Light and Coke Company is right on the job when it comes to improving the gas service. For the past 2 years considerable trouble has been experienced toward the end of the winter from the booster main on Huff street freezing, as when it was first put down it was laid too near the surface. Manager Clausen now proposes to replace this 3-inch booster with a 4-inch main from the plant on Third street to Wabasha street. This new main will be laid below the frost line, and when it is connected the old 3-inch main will be taken up. So that there will be no interruption of service, and no freezing next winter.

MR. R. C. GRAVELEY, formerly District Manager for the Western United Gas and Electric Company, at La Grange, Ills., has gone to Eau Claire, Wis., to take up his duties as Manager of the Eau Claire Gas Light Company.

THE Home Economics section of the New Haven (Conn.) Women's Club presented the New Haven Gas Light Company a large decorated fruit cake at one of the club's meetings, which are held at the gas company's rooms monthly. It bore 30 pink candles, representing that number of ladies comprising the presentation committee, and was an evidence of good will and public recognition of the club's appreciation of the good service rendered by the gas company. The large room set apart for these meetings is equipped with modern gas cooking and lighting appliances, and at one end is a model kitchen, containing a gas range, gas water heater, gas garbage burner, etc., used for the cooking demonstrations of the home economics section of the club.

SALES of gas in Philadelphia by the United Gas Improvement Company, in the quarter ended March 31, decreased 0.46% from the March quarter of 1914. Sales in cubic feet were 2,561,952,210, compared with 2,680,642,910 in the December quarter, and 2,659,381,310 for the March quarter of 1914. The money collected in the quarter was $2,616,102, received in payment for 2,616,102,860 cubic feet, of which 40,680 cubic feet were sold prior to January 1,1908, and 294,316 cubic feet sold between January 1, 1908, and January 1, 1913, and 2,615,787,820 cubic feet subsequently. The amount due the city under the lease is $523,210.

THE line that supplies natural gas to Waco, Texas, from the Mexia gas fields, was broken by the heavy rains 17 miles from Waco on April 22, at 1 A.M. Sufficent gas remained in the pipes and reservoirs to give weak pressure until about 2 o'clock Friday morning. Employes of the Texas Light and Power Company remained in the offices answering telephone calls until after 4 o'clock, explaining to early risers that the company was ready to turn on artificial gas as soon as it was safe. At 6 A.M. the company turned artificial gas into the mains.

GENERAL MANAGER WHITNEY announces that the Peoples Gas and Electric Company, Oswego, N. Y., will spend about $10,000 in improvements at the gas plant this Summer. A new purifying system is to be installed.

PROTESTS against Commissioner Merritt's plan to substitute electric for gas lights on Kent Road and East Sixth street, have been made to the Duluth, Minn., city council by a petition of residents. They object to electric light on the ground that they would necessitate unsightly poles on the streets; would not afford sufficient light, and would put out of commission gas light standards for which property owners paid a considerable sum. They ask that the gas lights be retained.

G. M. MACKIE, master mechanic of the Milwaukee (Wis.) Coke and Gas Company, was given honorable mention for his article on "To Systematize Safety Work," which appeared in a recent issue of "Safety Engineering."

THE Vinton (Ia.) Gas Company, in order to supply its ever increasing list of customers, has installed another steel compression tank of the same capacity as the four tanks that have been in use for some time. The tank has a capacity of 15,000 cubic feet, is 8 feet in diameter and 36 feet long.

AT the regular meeting of the Brockton (Mass.) Gas Light Employees' Association plans were discussed for the annual meeting the second Monday in June, and a committee appointed to revise the by-laws, to be acted upon at that meeting. The committee includes Joseph String, Mark Fitzmaurice and James P. Moran. An entertainment for the meeting in May will be in charge of John Pendergast, Henry Godet, Horace Nathan, Joseph String and E. B. Mooney. A progressive report was heard from the committee arranging for a joint outing with the Lynn association this summer.

OFFICERS of the Madison (Wis.) Gas and Electric Company were re-elected at the annual meeting of stockholders. They are E. B. Lathrop, New York, president; John H. Corscot, Madison, vice-president; F. L. Cross, Madison, general manager; John St. John, Madison, secretary-treasurer; C. N. Jeliffe, New York, assistant secretary. These directors were re-elected: E. B. Lathrop, R. B. Brown, Milwaukee; C. F. Cooley, John H. Corscot, F. W. Hoyt, John Grinde and A. E. Proudfit, Madison.

## UTILITIES COMMISSION NEWS.

LOCAL BOARD TO FIX LOS ANGELES RATES.—Public utilities rates for Los Angeles, Cal., will be fixed for the ensuing fiscal year, beginning July 1, by the city board of public utilities. President Lane has had a conference with Max Thelen, president of the State Railroad Commission, and the latter has agreed that it will expedite utilities rates for Los Angeles for the local board to fix them for the coming fiscal year, instead of the State Railroad Commission attempting to do so. Under the constitutional amendments adopted at the last election the authority to fix rates in all cities of the State is placed in the hands of the State Railroad Commission. Legislative action is necessary to place this amendment in effect, and the law will not go into effect until 90 days after the adjournment of the legislature. This will delay its operation until August 1, which will be too late for Los Angeles to have the new rates go into effect on July 1, as specified by the city charter.

NEW HAMPSHIRE BOARD THREATENS CRIMINAL ACTION.—The Strafford-York Gas Company, operating in Rochester and Somersworth, N, H., has been ordered to appear before the Public Service Commission to show cause why the company should not be proceeded against criminally for failure to conform to the rules of the Board. In the order the Commission declares that the company has repeatedly ignored the standards of purity, pressure and heating value of gas as prescribed in the Commission's order of Feb. 1, 1914. This is the first action of the Public Service Commission to take advantage of the authority given by the Legislature of 1913 to establish standards of service for public utilities.

OMAHA LOSES RATE CASE.—The people of Omaha, Neb., must continue to pay $1.25 gross a thousand for their gas until 1918. A permanent injunction was issued by United States District Judge Munger forbidding the city to enforce the ordinance passed in 1908 reducing the price of gas to $1; the contract entered into in 1893 by the mayor and council, without submission to the people, empowering the company to charge $1.25 a thousand for gas was declared valid and binding for 25 years. Attorneys for the city argued that this contract was obtained by fraud and that the mayor and council at the time had no power to make such a contract. Judge Munger based his decision almost wholly on the fact that the city did not question the validity of the contract for 15 years, and that because the city accepted the contract for that length of time it is now barred from questioning its validity. The ability of the company to furnish gas for $1 a thousand cubic feet was not submitted to the court, the company deciding to fight the case on the sole ground that the contract gave them the right to charge $1.25 a thousand for gas, regardless of how cheaply it could be furnished.

ENGINEER OF ILLINOIS COMMISSION.—Joseph M. Prior has been appointed acting chief engineer of the Public Utilities Commission of Illinois, succeeding Robert M. Feustel, whose resignation was recently noted. Mr. Prior was formerly assistant chief engineer of the Commission, coming from the engineering staff of the Chicago, Milwaukee & St. Paul Railroad at Chicago.

EXCLUSIVE FRANCHISE CARRIES OBLIGATIONS.— The Arizona Commission has ordered the Pacific Gas and Electric Company to extend its gas and electric service, and serve houses now constructed and to be constructed, in Oakland Addition, Phoenix. "The Commission is of the opinion from the report, that it is not unreasonable to require the respondent to extend its service into the Addition. A public service corporation occupying an exclusive field, such as presents itself in this instance, should hold itself in readiness to make reasonable extensions to serve new districts. The Commission is of the opinion that a company is entitled to protection against occupancy of an exclusive field only when a disposition is shown to comply with the foregoing principle."

TEXAS BILL SPECIFIES QUALIFATIONS OF COMMISSIONERS.—At the recent session of the Texas legislature a measure was introduced providing for the creation of a Public Utilities Commission, with authority to supervise all public corporations. The commission is to be composed of five members, appointed by the governor; and all members of the commission must be men of ability and successful in their business or profession. One must be a lawyer of 10 years' experience, one a civil or mechanical engineer, and one a successful financier. None of them can be politicians or affiliated with any public utility. The commission is to be given supervision over construction, bond issue, rates and charges, and may at its discretion provide for uniform systems of accounting.

# Financial Notes.

HOLDERS of the first lien sinking fund gold bonds, Series A and B, of the ATLANTIC GAS AND ELECTRIC COMPANY, New York, have received notice that a plan for the readjustment of the bonded debt has been adopted by the bondholders' protective committee. The company had $1,666,000 Series A and $807,500 Series B bonds outstanding. The collateral deposited as securiety for these bonds was purchased by the committee at foreclosure. An agreement has been made whereby the General Gas and Electric Company will acquire a large part of the assets of the company. The committee, therefore, will offer to holders of certificates of deposit for Atlantic A bonds new bonds of the General company of the same face amount and interest. The General company will advance money to the Atlantic company subsidiaries to meet liabilities caused by the bankruptcy. Each Series B depositor will receive either cash or notes of the Binghamton (N.Y.) Light, Heat and Power Company equal to 70% of the face amount of his deposited holdings. Those who do not participate in the plan will be entitled to their respective pro rata share of the proceeds of the foreclosure sale, which, it is estimated by the committee, will not exceed $112 per bond of $1,000 face value.

THE PEOPLES GAS COMPANY has declared the regular quarterly dividend of 2%, payable May 25 to stock of record May 3.

THE UNITED GAS IMPROVEMENT COMPANY reports for the year ended December 31:

| | 1914. | 1913. | Increase |
|---|---|---|---|
| Gross | $9,084,543 | $8,613,194 | $471,349 |
| Net | *7,896,400 | 6,471,107 | 425,293 |
| Dividends | 4,440,236 | 4,440,236 | ..... |
| Sinking fund | 801,300 | 790,500 | 10,800 |
| Surplus | 2,654,864 | 2,240.371 | 413,493 |

*Equal to 14 2 per cent. on $55,502,950 stock, against 13.46 per ce t. in 1913 and 13.56 per cent in 1912.

President Bodine says: Of net profits, $2,172,812 was derived from sale of securities referred to in last year's report, so that net profits from regular sources exceeded sinking fund requirements and regular 8% dividend by $482,051. The falling off in net from regular sources was due to continued shrinkage of returns from investments in natural gas pipe lines and distributing companies in Missouri and Kansas and to high price for gas oil which prevailed until late in the autumn.

THE CONSOLIDATED GAS COMPANY, New York, has declared the regular quarterly dividend of 1½% and an extra dividend of ¼ of 1%, payable June 1-June 15 to stock of record May 12. Following this action, Consolidated Gas stock rose 4½ points. In explanation of the increase in the dividend the following statement was issued by President George B. Cortelyou:

"The value placed on the assets of the Consolidated Gas Company by the United States court in the 80 cent gas case exceeds the value at which they were carried on the company's books by over $15,000,000. Obviously, therefore, the company is undercapitalized and, therefore, a 7% dividend on its outstanding capital stock amounts to much lower rate of return than 7% upon the actual value of its properties. It will probably be a surprise to many to know that more than three-quarters of the dividend of the Consolidated Company is derived from its investments in other gas companies and in electric light companies, and that less than one-quarter of it is derived from its own gas business."

THE QUEENSBORO GAS AND ELECTRIC COMPANY, New York, comparative statement of operation for 1914 and 1913 follows:

| | 1914. | 1913. |
|---|---|---|
| Electrical department: Operating income | $125,758 | $125,650 |
| Gas department: Operating income | 77,894 | 83,577 |
| Total operating income gas and electric | $203,652 | $309,227 |
| Non-operating income | 1,012 | 3,387 |
| Gross income applicable to corporate and leased properties | $204,664 | $212,614 |
| Income deductions | 131,507 | 126,107 |
| Net corporate income | $ 73,157 | $ 86,507 |
| Previous surplus | 229,811 | 162,177 |
| Surplus adjustments—net deduction | 6,388 | 18,873 |
| Surplus at close of year | $296,580 | $229,811 |

THE ST. PAUL GAS LIGHT COMPANY, a subsidiary of the American Light and Traction Company, has sold to William A. Read & Company $650,000 general mortgage 5% bonds, due March 1, 1944.

THE New York Public Service Commission has approved the issue by the ELMIRA WATER, LIGHT AND RAILROAD COMPANY of $232,000 par value of its 5%, 50-year, first consolidated mortgage bonds. They will be sold at not less than 90 to net not less than $208,800, and the proceeds, together with $1,500,000 to be received from the city of Elmira for the sale of the company's water department, will be used to call and redeem at 105 and accrued interest $1,661,000 par value of the company's first purchase money mortgage bonds. The company in its petition to the Commission also prays for approval of the sale of the water department to the city of Elmira, but this is not passed on in the present order.

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